VOLUME 15 NO. 1
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Journal of

MILK and FOOD TECHNOLOGY

Official Publication

International Association of Milk and Food Sanitarians, Inc.

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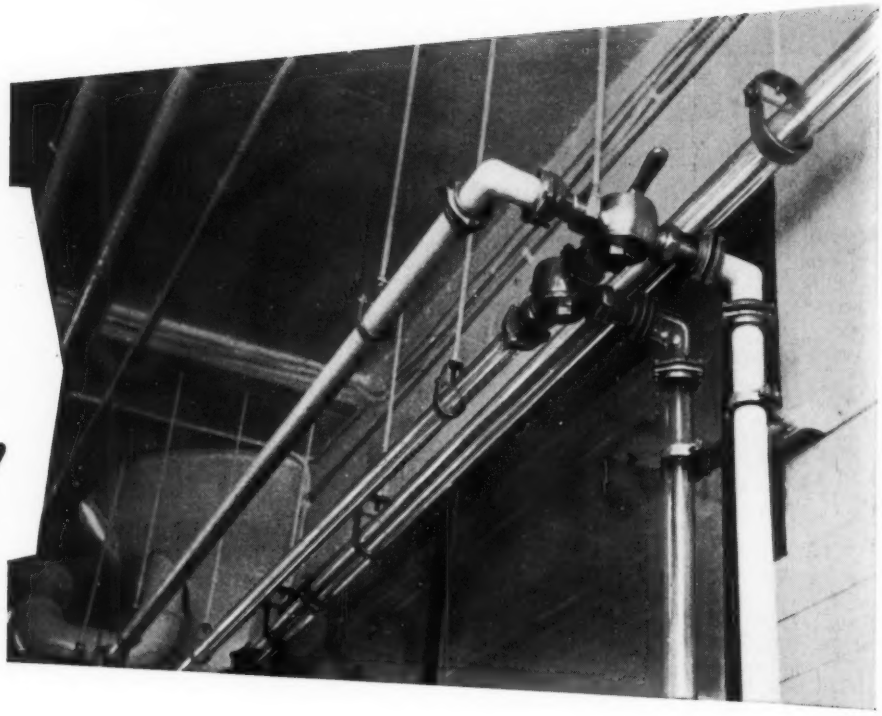

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Journal of

MILK and FOOD TECHNOLOGY

INCLUDING MILK AND FOOD SANITATION

Official Publication

International Association of Milk and Food Sanitarians, Inc.

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CONTENTS

Editorials:	*Page*
President's Message	1
Our Fortieth Anniversary;	2
An Improved Procedure for Microscopic Grading of Milk Intended for Pasteurization — *M. E. Morgan, P. MacLeod, E. O. Anderson and C. I. Bliss*	3
Influence of Refrigerated Storage on Dye Reduction Time of Milks — *C. K. Johns*	8
Report of Committee on Food Equipment	13
3A Sanitary Standards of Plate Type Heat Exchangers for Milk and Milk Products	14
Report of the Committee on Milk Regulations and Ordinances	15
Easily Constructed Time-Saving Apparatus for Filling Dilution Bottles — *H. Pivnick*	16
Report of the Committee on Communicable Diseases Affecting Man	17
National Conference on Interstate Milk Shipments — *J. L. Rowland*	19
Report of the Committee on the Professional Status of Sanitarians	26
A Single Reagent Field Test for Quaternary Ammonium Solutions — *D. B. Conklin*	27
Sanitization of Dairy Farm Utensils. A Comparison of a Cleaner Sanitizer Containing Hyamine 1622 with an Alkaline Cleaner and Hypochlorite Sanitizer — *W. E. Botwright*	29
Insulating Glass — Studies in its Use in Milk Houses and Dairy Barns — *W. E. Eakin*	34
Association News:	
Affiliates of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS	37
General News	37
Public Forum	42
Practical Ideas	43
Industrial Notes	44
Bulk System of Handling Milk from Farm to Dairy — *A. C. Woodruff*	45
Index to Advertisers	XVI

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HORSEFLIES (Tabanids) REDUCE BUTTERFAT

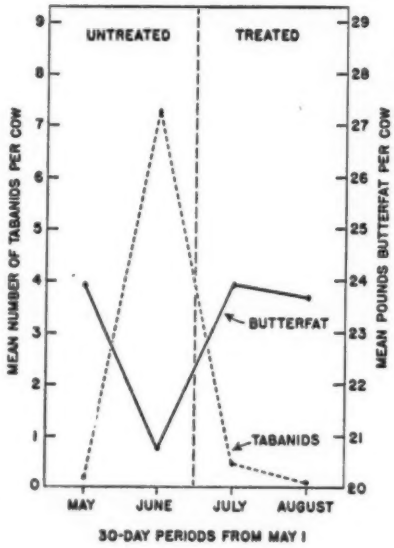
and only PYRENONE* controls tabanids

ILLINOIS TESTS SHOW EFFECTS OF PYRENONE* SPRAYS ON BUTTERFAT PER COW

TABANIDS (horseflies) reduced butterfat production by *more than 20%* in 25 dairy herds on which tests were conducted in Southern Illinois, as reported in a recent issue of the *Journal of Economic Entomology*. This loss was eliminated by treating 12 of the 25 herds to control tabanids with Pyrenone* insecticides (even though all 25 herds were previously sprayed with DDT, methoxychlor or oil spray repellents).

Spraying with Pyrenone twice a week or oftener reduced tabanids by *90 per cent or more*, and even once-a-week spraying reduced tabanid population by 85 per cent.

Butterfat data were used in preference to milk production figures, since it was felt that reduction in milk flow might be accompanied by an increase of butterfat content, the report points out. However, during the horse fly outbreaks there was *a reduction in butterfat content as well as milk flow.*



THIS TABLE shows the effect of Pyrenone spraying on the tabanid population and the butterfat production per cow. During May and June, the 12 treated herds were sprayed with DDT, methoxychlor or oil spray repellents which are not effective on tabanids. As the build-up of tabanid population proceeded through June, the production of butterfat dropped more than 20 per cent.

On the last day of the June test period, spraying with Pyrenone was begun on the 12 herds included in this chart. There were 13 other herds on which no Pyrenone was used. During July, the butterfat production of the 13 other herds continued to go down, whereas the 12 herds which were sprayed with Pyrenone showed a return to normal production of butterfat, as shown in this chart.

By August, the tabanid infestation had nearly passed, and the untreated herds began to increase in butterfat production, but it still was more than 20 per cent below what it had been before tabanids appeared. Meanwhile, the 12 treated herds included in this chart maintained normal production.

One of the 10 charts and tabulations computed from these tests is shown above. Others show such figures as the count of tabanids per animal and similar data. For example, during July, the 13 herds which were not treated with Pyrenone showed an average of 8.50 tabanids per animal while the 12 sprayed herds averaged only 0.38 tabanids per animal.

"Animals in continuous lactation showed highly significant changes in the slope of their butterfat production gradients at the time of treatment," says one of the conclusions from this test.

Pyrenone*

***Registered trade mark of National Distillers Products Corporation. Pyrenone designated combinations of piperonyl butoxide and pyrethrins supplied to manufacturers of insecticides by U. S. Industrial Chemicals Co. Division of National Distillers Products Corporation, 60 East 42nd Street, New York 17, N. Y. In Canada: Natural Products Corporation, 738 Marin Avenue, Montreal, Canada.**

EDITORIAL NOTES

PRESIDENT'S MESSAGE

Greetings, Fellow Members:

I assume the duties of the Presidency with a deep feeling of being highly honored. I suppose my position is unique, in that I am doubly honored by also being your first full time Executive Secretary. When I was offered this position I hesitated to take it because, mainly, I thought it might be necessary to resign as President-Elect. Honestly, I should have been sorry to forego the honor of being president of an Association such as ours. The Executive Board did not feel that it would be necessary for me to resign. The Nominating Committee and the membership at our Convention in Glenwood Springs apparently did not think so either. I shall do my very best to deserve your confidence.

One of the most fortunate facts connected with the history of our Association is that we have been blessed with many good officers who according to our Constitution compose the Executive Board. I hope I can be as good a president as many of our past presidents have been. Your present officers have been one of the hardest working group you have had, principally, perhaps, because many crucial problems had to be solved if this organization was to continue to maintain and improve its place in the sun.

Our affairs have been administered by part-time personnel, from four widely separated locations. How this personnel did as well as they did is amazing to me. Each of them had three strikes on them before they started. Efficient administration of the business affairs of an organization as large as ours, under such a plan, is utterly impossible. Many, many mistakes are sure to occur from a set-up of this kind. I wish I could make each of you realize what a big job it is to handle just the correspondence from members and subscribers in forty-eight states and fifty-six foreign countries, to say nothing of the publication of the Journal and the handling of the financial affairs. The establishment of an office, centrally located, with full-time personnel, and the publication of the Journal, within a city block of this office, is, I believe, one of the best and most beneficial steps taken by your present board. Under this type of situation, the person responsible has a real chance of succeeding.

Another very important program adopted by the Executive Board is that of favoring affiliate associations. Our greatest strength is through well-organized and active affiliates. A member can now belong through a state association for the same cost as a direct member. The newly organized Advisory Council will give the affiliate associations a greater voice in the affairs of International Association.

Both direct and affiliate members are now favored since the rate for a non-member subscription is $5.50 annually. For many years the subscriber was favored instead of the member; this never made sense to many of us, since the membership made it possible to publish the Journal in the first place.

Plans are well underway for an increasing number of food articles and many practical articles for the sanitarian right out on the firing line. We have all felt the need of these articles for some time.

Our immediate past president, K. G. Weckel, has developed a special annual award of $1000.00 to be given to the member judged to have rendered the most outstanding service in the field of milk and food sanitation. An award for the most practical idea for improving your work as a Sanitarian is to be given every third issue of the Journal.

The membership voted at Glenwood Springs to establish a committee for the development of a program to bring about professional recognition of the milk and food sanitarian. I am sure all of us have felt the need of this for many years.

Finally, it is my hope, and plans are already going forward, to provide funds for committee work which will take care of travel expenses of committee members, thus overcoming the difficulty of getting important committees together.

Also, I hope to begin monthly publication of the Journal in the not too distant future, at no increase in cost to the membership or subscribers. Soon a plan for increasing funds of the affiliate associations in cooperation with the International Association, will be mailed to every member of the affiliate associations. I hope these funds will be used to provide excellent programs for local meetings and educational purposes.

I know of only one way to accomplish the plans outlined to you in this message. HARD WORK. Will you help me?

H. L. THOMASSON, *President,*
INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC.

OUR FORTIETH ANNIVERSARY

It was on October 16, 1911, that the INTERNATIONAL ASSOCIATION OF DAIRY AND MILK INSPECTORS (now the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC.) held its first meeting. Thirty-five men from Australia, Canada, and the United States met at Milwaukee, Wisconsin, and started an organization which has just completed it fortieth year of continuous operation. One of the early members — and in so far as we know, the only surviving one—Dr. James A. Gamble, just sent us the accompanying clipping and the original promotion letter from Charles J. Steffen, then the Chief Dairy Inspector of Milwaukee.

Health Department
City of Milwaukee
F. A. Kraft, M. D., Commissioner
F. W. Luening, Secretary

B O O S T — Milwaukee, Wis., Oct. 26, 1911

J. A. Gamble
Springfield, Mass.

My dear sir and fellow-worker:

Your letter received with pleasure. You can become a member by applying to Prof. Ivan Weld, Wash., D. C., our Sec.-Treas. International Association of Dairy and Milk Inspectors.

Kindly boost for our association and we expect one grand convention next year.

Officers are as follows:

President Chas. Steffen ..... Milwaukee
1st Vice-President, G. M. Henderson ..... Seattle
2nd Vice-President, Dr. William H. Price .... Detroit
3rd Vice-President, Geo. M. Whitaker .... Washington
Sec.-Treas., Ivan Weld ..... Washington, D. C.
The above men are the Executive Committe.

Auditors one year
Dr. C. B. Sherman, Chicago
Walter J. Frazer, Salt Lake City

Committee on By-Laws
Geo. Whitaker, Washington
Prof. J. O. Jordan, Boston
Ivan Weld, Washington

In the near future we will have our printing and blanks out and will not use Health Dept. stationery.

The "next year" referred to above was held in Milwaukee with the presentation of sixteen papers in sessions held in the mornings, afternoons, and evenings — an enthusiastic, earnest, far-seeing group.

Some of these early developments appear in the article by J. H. Shrader, This Journal, pages 127-135 (1948). In it he stated that the membership was then (1948) 2210 with the Journal going to 31 foreign countries, but now the Journal has a circulation of over 4500 and goes to 57 foreign countries.

J. H. Shrader

AN IMPROVED PROCEDURE FOR MICROSCOPIC GRADING OF MILK INTENDED FOR PASTEURIZATION

MAX E. MORGAN, PATRICIA MACLEOD, AND E. O. ANDERSON,
Department of Animal Industries, Storrs Agricultural Experiment Station
Storrs, Connecticut,
and
C. I. BLISS
Biometrician, Connecticut Agricultural Experiment Station,
New Haven, Connecticut

Sequential analysis has been applied to the microscopic grading of raw milk for three common bacterial standards. Simple grading tables have been developed which permit rapid acceptance or rejection of good and poor milk respectively but require maximum examination of borderline milk. Routine use of sequential grading requires considerable less microscopic examination and yields results of a precision equal to or greater than that expected with the present standard procedure.

In the present standard method for microscopic grading of raw milk intended for pasteurization the number of microscopic fields examined for bacterial clumps is constant within four rather wide ranges of counts[1]. The number of fields examined is essentially the same for milks in which the count approaches the grade limit set by regulation as when the count falls very much below or above the limit. A more efficient counting procedure would allow rapid acceptance of "good" milk or rejection of "poor" milk and concentrate attention on "borderline" milk.

If the present method operated ideally, all milks accepted as meeting a given grade limit would have less than the legal limit of bacterial clumps per ml and all milks rejected would have more. Because of the random variation of clumps among the microscopic fields examined this ideal is not realized. Some milks with fewer bacteria than the prescribed limit are rejected and other milks with more than the limit are accepted. The probability of these two types of errors may be referred to as the "producers' risk" and the "consumers' risk" respectively. Heretofore the magnitude of these risks has not been defined.

The authors have recently studied the distribution of bacterial clumps in standard milk films[2]. The following results were pertinent to the development of an improved grading procedure.

1. The distribution of bacterial clumps in milk films with means in the range from 0.18 to 1.05 clumps per field* agrees substantially with the Poisson series.

2. Despite this evidence of their random distribution, bacterial clumps are more concentrated in a central area of a film than in the remaining border area, indicating that fields selected in routine counting should be limited to representative portions of the film.

3. Microscopic clump counts of different films from the same sample of milk seldom differ significantly when the mean count is less than 1.05 clumps per field.

On this evidence a sequential grading procedure has been developed which is considerably more efficient that the present standard method.

A recent survey[3] indicates that 31 states and most larger cities enforce bacterial standards of 100,000 -200,000 per ml for the best grades of raw milk intended for pasteurization. The purpose of this paper is to present in simplified form the development of the proposed sequential grading procedure for a bacterial standard of 200,000 clumps per ml and to offer additional grading plans for standards of 100,000 and 400,000 clumps per ml.

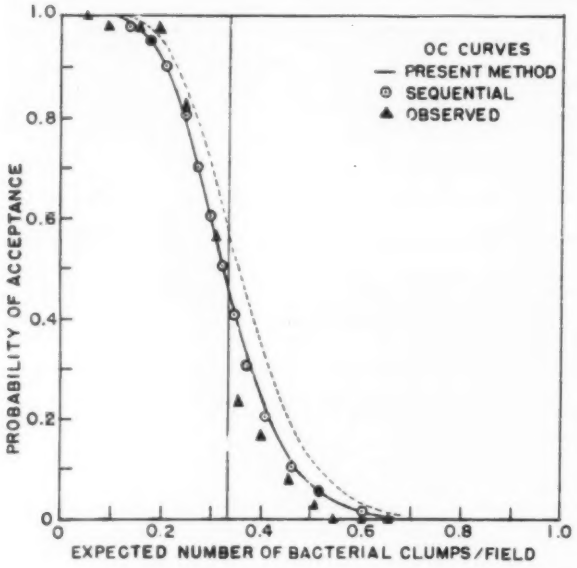
OPERATING CHARACTERISTIC CURVE OF THE PRESENT STANDARD METHOD

When using a microscopic factor of 600.000, milk meeting a standard of 200.000 bacterial clumps per ml must not average more than one-third bacterial clump per field in 30 fields. Ideally, every milk of this grade would contain fewer than 200,000 bacterial clumps per ml. This limit corresponds to the vertical line in figure 1 at 0.33 clump per field; all milk to the left of this line would be accepted and all milk with a larger bacterial content would be rejected.

Because the number of climps varies at random from field to field, this ideal is not realized in practice. Some samples of milk with fewer bacteria than the legal requirement are unavoidably rejected and other samples with more than the requirement are accepted. The precision of the present method of grading is expressed quantitatively by its "operating characteristic (OC) curve", as show in figure 1. The probability of acceptance of a sample of milk is plotted against its theoretical true bacterial content, expressed as clumps per field, when any milk is rejected which has a total count of 10 or more clumps in 30 fields. This means that borderline milk, which contains an estimated 200,000 clumps per ml would be rejected, although it would be accepted under the usual interpretation of the present regulations. If counts of 10 clumps or less are accepted the OC curve is represented by the dotted line in figure 1. Use of this curve would reduce the producers' risk by increasing the probability of accepting samples which should be rejected. Conversely the consumers' risk is increased. Since the solid curve in figure

* Microscopic factor = 600,000.

Dr. Max E. Morgan was graduated from the State College of Washington in 1939 and received his MS from the University of Connecticut in 1941. Upon return from service as a bacteriologist in the U. S. Army Sanitary Corps he completed his Ph. D. in dairy bacteriology at Iowa State College in 1948. He is now Associate Professor of Dairy Manufacturing at the University of Connecticut.



1. Operating characteristic curves for a grading limit of 200,000 clumps per ml.

1 is nearer to 50 percent acceptance at the grade limit, it is believed to express better the intent of of the regulations.

As interpreted from these curves 20 percent of the milks now passed as meeting a limit of 200,000 clumps per ml would be expected to have counts of 250,000 clumps per ml or more. Conversely, more than 28 percent of the milks having only 180,000 clumps per ml would be rejected.

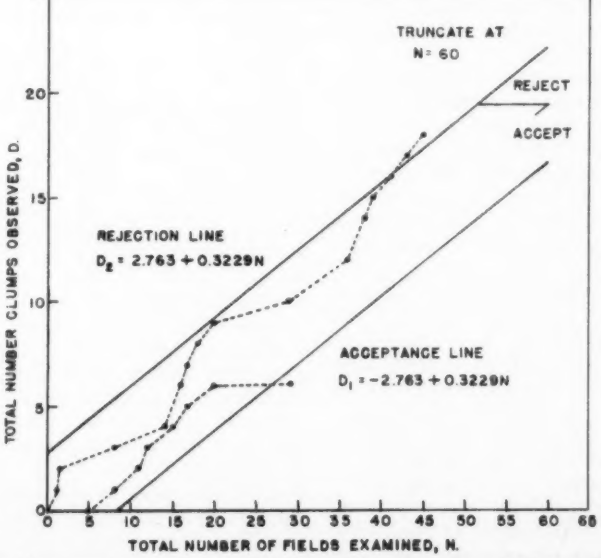
DESIGN OF THE SEQUENTIAL GRADING PROCEDURE

Sequential inspection is a statistical method in which the number of items to be inspected from a lot is not predetermined. The decision to accept or reject the lot depends at each stage of the inspection on the cumulative result of the previous observations[4]. In applying this technique to the microscopic grading of milk, after each field is counted, the milk is (1) accepted as meeting the grade standard, (2) rejected as not meeting the grade standard, or (3) the examination is continued.

In designing a sequential grading plan for a standard of 200,000 clumps per ml, two points were selected on the present OC curve at which 5 percent of the samples would be rejected and 5 percent accepted. The sequential curve was then made to coincide with the present OC curve at these points, representing theortical counts of 0.18 or less and of 0.52 or more clumps per field respectively. These counts correspond to 108,000 and 312,000 clumps per ml and are indicated in figure 1 as solid circles.

Limiting the number of samples which would be accepted or rejected incorrectly to 5 percent at expected clump densities of 0.18 and 0.52 per field and the assumption that the distribution of clumps in standard milk films follow a Poisson series, completely determined the sequential plan. The sequential grading plan is defined graphically by the two parallel lines in figure 2. The abscissa N is the number of fields counted and the ordinate D is the total number of clumps observed at a given number of fields. The calculation of the equations for the slopes of the two lines is described in full in reference[5]. The sequential grading of two samples of milk is illustrated in the figure by dotted lines. As soon as the cumulative count of the upper sample crossed the rejection line the count was terminated and the sample was rejected as not meeting the standard. When the count of the second sample crossed the acceptance line, it was acceped without further counting.

To check the agreement of the proposed sequential plan with the present standard grading procedure, values for the expected sequential OC curve were calculated as described in reference[5]. These points are plotted in figure 1 as



2. Graphic presentation of the sequential grading plan for a 200,000 clump limit and the results for two films.

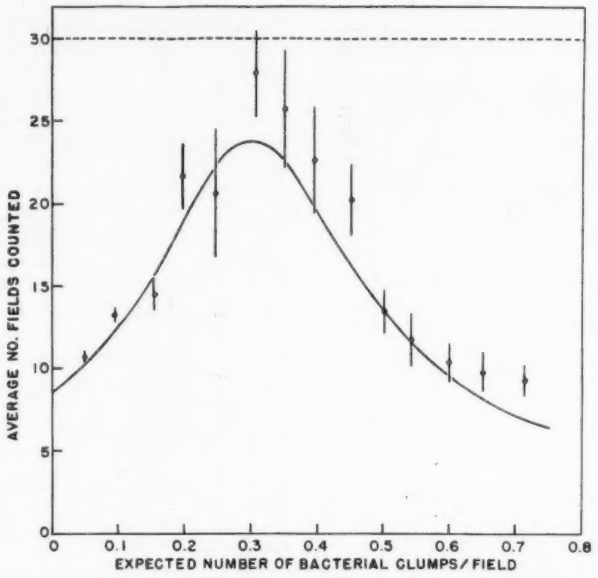
open circles. Although the curves were forced to agree at the 5 and 95 percent points, the sequential curve was free to diverge at other levels. The points calculated for the sequential plan agree satisfactorily with the present OC curve and where they diverge the sequential plan lessens both the producers' and consumers' risk.

Sequential sampling is known to reduce substantially the number of units which must be examined as compared with a fixed sample size. The curve in figure 3 shows the average sample number (ASN) for different expected clump densities with the sequential grading procedure, as determined theoretically for a Poisson distribution[5]. The number of fields is largest when the expected number of bacterial clumps per field is slightly less than 0.33, the grade limit. This number decreases as samples are either more or less contaminated. The uniform number of fields specified in the standard method for a grade limit of 200,000 clumps per ml is indicated by the horizontal dotted line at 30 fields. The expected saving in microscopic examination through use of the sequential procedure is considerable.

For any individual milk the number of fields required to reach a decision may be larger or smaller than the expected ASN. While it is unlikely to exceed two or three times the ASN for a given film, the process may be terminated at some agreed upper limit. Wald[4] states than truncation at two and one-half times the maximum ASN has but little affect on the producers' and consumers' risks. Since the maximum ASN is 24 fields the count may be truncated at 60 fields on borderline milks. A milk that had not been accepted or rejected would be accepted if after counting this number of fields it fell in the lower half of the intermediate zone and rejected if it fell in the upper half. As shown in figure 2 a count of 19 or fewer bacterial clumps in 60 fields would be accepted and one reaching a count of 20 or more would be rejected.

PROPOSED GRADING PLAN

Whether to accept or reject milk for a legal limit of 200,000 clumps per ml may be determined as each field is counted from table 1. This



3. Expected and observed average number of microscopic fields examined in reaching a decision to accept or reject a sample with the sequential plan for a 200,000 clump limit.

table has been based upon the equations for the acceptance and rejection lines in figure 2.

Bias due to the concentration of bacterial clumps in the central area of a film[2] can be minimized by restricting the selection of fields for counting. A count should be started about one-quarter of the way down from the upper edge of the film and a few fields inside the left margin. Five fields are counted across the film, selecting fields at random with the eyes removed from the oculars. The number of clumps is recorded after examining each field and the cumulated number compared with the acceptance and rejection limits in table 1. Further 5-field transits of the film are made at intervals of 2 to 5 fields down the film until a decision can be reached, terminating after not more than 60 fields or 12 transits.

TABLE 1

SEQUENTIAL GRADING TABLE FOR GRADE LIMIT OF 200,000 CLUMPS PER ML

A milk in which the total number of bacterial clumps does not exceed the acceptance number d^1 in a given number of fields is accepted; one in which it equals or exceeds the rejection number d^2 is rejected.

Field no.	d^1	d^2	Field no.	d^1	d^2	Field no.	d^1	d^2	Field no.	d^1	d^2
1	....	4	16	2	8	31	7	13	46	12	18
2	....	4	17	2	9	32	7	14	47	12	18
3	....	4	18	3	9	33	7	14	48	12	19
4	....	5	19	3	9	34	8	14	49	13	19
5	....	5	20	3	10	35	8	15	50	13	19
6	....	5	21	4	10	36	8	15	51	13	20
7	....	6	22	4	10	37	9	15	52	14	20
8	....	6	23	4	11	38	9	16	53	14	20
9	0	6	24	4	11	39	9	16	54	14	20
10	0	6	25	5	11	40	10	16	55	14	20
11	0	7	26	5	12	41	10	17	56	15	20
12	1	7	27	5	12	42	10	17	57	15	20
13	1	7	28	6	12	43	10	17	58	15	20
14	1	8	29	6	13	44	11	17	59	16	20
15	2	8	30	6	13	45	11	18	60	19	20

EXPERIMENTAL TESTS WITH THE SEQUENTIAL GRADING PROCEDURE

The proposed sequential grading procedure has been tested on data collected in studying the distribution of bacterial clumps in milk films[2]. Clump counts of at least 100 fields were available from each film. The selection of field counts for testing the sequential procedure approximated the method proposed above. In the low count films as many as 11 sequential counts could be obtained from the record of 100 fields. Each sequential test was given equal weight, whether one or many counts were taken from the same film. The number of such tests totaled 571.

A salient feature of the sequential method is that the number of fields counted depends upon the true mean clump count per field. Our best estimate of the true value for each film was the mean of all 100 fields. The results obtained sequentially were grouped in terms of this mean by intervals of 0.05 clump per field. Within each grouping interval the record showed the number of films accepted, rejected and truncated, and the frequency distribution of the observed number of fields required for a decision. From the latter distribution the mean sample number and its standard error was determined for each interval.

The proportion of tests accepted by the sequential procedure has been plotted as solid triangles against the mean clump count per field in figure 1. The observed proportions were based upon varying numbers of tests with a mean of about 36 per point. The experimental values agreed satisfactorily with the expected OC curve for the present standard method and the sequential plan. Where they differed, the divergence usually improved the OC curve, so as to reduce the number of milk samples classified incorrectly.

The observed ASN exceeded that expected in a majority of the sampling intervals. In individual cases the difference between the observed and the expected values was not statistically significant. This is clear from the standard errors plotted in figure 3. With few exceptions, however, the ratio of the observed to the expected mean was larger than 1. In the clump range for 5 and 95 percent acceptance, the ratio of the observed to the expected ASN was $1.101 \pm .040$.

The larger number of counts may be due not only to an occasional non-random distribution of clumps in the film but also to the fact that the number of fields counted is nessarily discrete. The calculated number of clumps at the acceptance and rejection levels was never a whole number. This necessitates continuing the count beyond the number expected theoretically in computing the observed ASN and may account for much of the discrepancy. It is doubtful that truncation contributed to the larger sample number. Only three sequential counts were truncated, representing 5 percent or less of the tests in their respective grouping intervals.

Although more counts were needed in practice than the number expected, many fewer fields were examined by the sequential plan than with a uniform sample number. Within a clump range determined by 98 and 2 percent acceptance levels on the OC curve, 5518 fields were counted sequentially in 289 tests. If 30 fields had been counted routinely, as recommended in the present standard method for a grade limit of 200,000 clumps per ml, 8670 fields would have been required. This represented a saving of 36 percent in the number of fields examined.

GRADING PLANS FOR LIMITS OF 100,000 AND 400,000 CLUMPS PER ML

The acceptance or rejection of milk for legal limits of 100,000 and 400,000 clumps per ml may be determined from tables 2 and 3. These grading plans were developed in the same manner as that for the 200,000 clump limit. Expected sequential OC curves were constructed so that they agreed with the present OC curves at acceptance levels of 95 and 5 percent of milk samples. Here again the expected sequential curves agreed well with the present OC curves and divergent points tended to lessen the producers' and consumers' risks.

The equations for the acceptance and rejection curves comparable to those in figure 2 were calculated as $d^1 = -1.917 + 0.1559N$ and $d^2 = 1.917 + 0.1559N$ for the 100,000 clump limit and $d^1 = -2.763 + 0.6458N$ and $d^2 = 2.763 + 0.6458N$ for the 400,000 clump limit.

The maximum expected average sample numbers for the two grades were 24 and 12 respectively as compared to the present recommended constant sample numbers of 30 and 15. In setting up the grading tables (tables 2 and 3) the number of fields to be examined was limited to two and one-half times the maximum ASN or 60 and 30 fields respectively. These sequential plans were then tested in the same manner as that for a limit of 200,000 clumps. Totals of 479 and 1080 sequential tests of the two plans were made on available film count data.

SEQUENTIAL GRADING TABLE FOR GRADE LIMIT OF 100,000 CLUMPS PER ML.

TABLE 2

Clumps observed	Accept at	Reject at
Total No.	*Fields*	*Fields*
0	13-18	–
1	19-25	–
2	26-31	–
3	32-37	1-6
4	38-44	7-13
5	45-50	14-19
6	51-57	20-26
7	58-59	27-32
8	60	33-39
9	60	39-45
10	60	46-60

TABLE 3

SEQUENTIAL GRADING TABLE FOR GRADE LIMIT OF 400,000 CLUMPS PER ML

Field no.	d1*	d2*	Field no.	d1*	d2*	Field no.	d1*	d2*
1		4	11	4	10	21	10	17
2		5	12	4	11	22	11	17
3		5	13	5	12	23	12	18
4		6	14	6	12	24	12	19
5	0	6	15	6	13	25	13	19
6	1	7	16	7	14	26	14	20
7	1	8	17	8	14	27	14	20
8	2	8	18	8	15	28	15	20
9	3	9	19	9	16	29	15	20
10	3	10	20	10	16	30	19	20

*Interpret as in table 1

The resulting observed OC curves compared satisfactorily with those expected for the two grades. Any divergence tended to reduce the number of samples graded incorrectly.

The observed ASN exceeded that expected in the majority of sampling intervals for clump limits of both 100,000 and 400,000. In the clump range from 5 to 95 percent acceptance, the ratios were 1.061 $\pm$ .036 and 1.211 $\pm$ .049 respectively. Only the latter ratio was significantly greater than 1. Within the clump count range for acceptance levels of 2 and 98 percent, 7854 fields were counted sequentially in 429 tests for the 100,000 clump grade. If 30 fields had been counted uniformly as recommended in the present standard method for this grade, 12.870 fields would have been required. In the corresponding range for the 400,000 clump grade, 6856 fields were counted sequentially in 612 tests, and 9180 fields would have been required if the recommended 15 fields had been examined in each test. These represent savings of 39 and 25 percent respectively in the number of fields examined for the two grades.

DISCUSSION

The initial OC curves calculated in this study measure the relative precision of the current standard microscopic procedure for grading milk. To insure acceptance of 95 percent of milk for grade limits of 100,000, 200,000 and 400,000 clumps per ml, producers cannot permit the true clump count of their milk to exceed 39,400, 108,000 and 217,000 clumps per ml respectively. Conversely, 5 percent of the milk passed as meeting these grade limits exceed counts of 183,000, 315,000 and 630,000 clumps per ml respectively. These estimates are based upon rejecting milk with a count exactly at the grade limit. Except for this modification, which adjusts the producer and consumer risks more equitably, the present standards of acceptance and rejection have been retained in the present study.

The primary objective has been to develop a grading procedure of defined precision which would distribute the microscopic work more efficiently than the present method. In applying sequential analysis to the problem, the proposed grading plans have been based upon levels of contamination at which 95 and 5 percent of milk samples are now passed in each grade. This has reduced the producer and consumer risk in the intervening zone. The applicability of the sequential procedure does not depend upon the levels which have been selected here and made to coincide with the present levels of acceptance and rejection. If the curves agreed at 99 and 1 percent, for example, the sequential OC curves would be steeper but a larger number of fields would have to be counted. More stringent limits could be adopted for the consumers' than for the producers' risk or vice versa. Given the greater efficiency of the sequential procedure more rigid adherence to grade limits may be both practicable and desirable.

SUMMARY

Simple sequential tables have been developed for three grades of raw milk which permit making decisions to accept or reject the milk or to continue the examination as each microscopic field is counted. Use of these tables permits rapid acceptance and rejection of good and poor milk respectively but increases the inspection of borderline milk. The major advantage of sequential grading is that an examination of fewer microscopic fields yields results of a precision equal to or greater than that expected with the present standard procedure.

REFERENCES

1. *Standards Methods for the Examination of Dairy Products*, 9th ed. American Public Health Association, New York. (1948).

2. Morgan, Max E., MacLeod, Patricia, Anderson, E. O., and Bliss, C. I. A Sequential Procedure for Grading Milk by Microscopic Counts. *Storrs (Connecticut) Agricultural Experiment Station* Bulletin No. 276. (1951).

3. Sanitary Milk and Ice Cream Legislation in the United States. *Bulletin of the National Research Council*, No. 121. (1950).

4. Wald, Abraham. *Sequential Analysis*. John Wiley and Sons, Inc. New York. (1947).

5. Statistical Research Group, Columbia University, *Sequential Analysis when Quality is Measured by the Number of Defects per Unit*. SRG Report 255, Section 7, (1946).

Milk and Milk Products, by C. H. Eckles, W. B. Combs and H. Macy. Fourth edition. Published by Mc Graw-Hill Book Company, New York. 1951. 454 pages. 95 figures. $5.00.

This book has been slightly enlarged over the previous edition (published in 1943). Some new material has been added, especially in the introduction, and the chapters on microorganisms, new equipment, butter, ice cream, dry milk and tests.

An Introduction to Foods and Nutrition, by H. C. Sherman and C. S. Landford. Third Edition. Published by the Macmillian Company, New York. 1951. 454 pages. 36 figures.

Much new material has been added, chapters rewritten, illustrations added, and new references, some of which are as late as 1950.

A B C's of CMP — U. S. Department of Commerce National Production Authority. Published by U. S. Government Printing Office, 1951.

This booklet is intended to serve as background information and a short refresher course in the principles and operating procedures of the controlled Materials Plan. Copies of the complete regulations, and detailed operating instructions for those directly affected by CMP, will be available from NPA in Washington or the nearest Field Office of the Department of Commerce.

INFLUENCE OF REFRIGERATED STORAGE ON DYE REDUCTION TIME OF MILKS

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Working with 100 weigh-can samples from 5 dairies it was found that icing for even 2 hours slightly retarded reduction of methylene blue; after 23 hours the effect was somewhat greater when the dye was present, but not when it was added just before incubation. With resazurin, on the other hand, there was better agreement when the dye was present during overnight storage. In no instance was the difference statistically significant. Methylene blue reduction times were in surprisingly close agreement with standard plate counts on the raw milk, while the correlation between reduction times (raw) and plate counts after laboratory pasteurization was better than was expected.

INTRODUCTION

In routine control work milk can rarely be tested immediately after sampling. Consequently, the manner in which samples are handled in the interim period is of some importance. In 1939, *Standard Methods for the Examination of Dairy Products*[2] stated that tubes of milk could be stored in ice water for up to 2 hours before starting their incubation. The purpose of limiting this period was to avoid too solid setting of the cream layer[22]. This was extended to 24 hours in 1948[3] because (a) the 2-hour requirement was inconvenient and was not being observed, and (b) if a storage period of 6 hours, in common practice, was not distorting the picture, overnight refrigeration might also be acceptable. Studies conducted by the Standard Methods Committee[1] on the effect of overnight refrigeration yielded results (unpublished) which were believed to warrant such a procedure and this was incorporated in the 9th edition of Standard Methods[3].

The desirability of overnight refrigeration has recently been questioned. Calbert and Wallenfeldt[5] expressly warn that tubes of milk, or milk plus dye, must not be held in ice water for over 2 hours before testing. These workers believe that great differences in results may occur when samples are held in ice water for long periods before incubation[23].

The influence of refrigerated storage on the reduction time of milk has been studied by a number of workers, [4, 6, 7, 9, 10, 11, 12, 13, 16, 18, 19, 20, 21, 24] most of whom have reported that the methylene blue reduction time was lengthened as a result of overnight refrigeration. Frayer[9] found an increase of about 9 percent for all grades of milk; Wilson [24] noted an average increase of 5 to 10 minutes for uncooled raw milk, and a decrease of 25 minutes for a poorer grade of previously cooled milk. Johns[13] found the average reduction time shortened by one hour in one series while in another series[12] there was an average time difference of only 3 minutes. Morton and Vincent[16] in Australia reported that icing for 24 hours had little effect with methylene blue, but was more serious with resazurin. Eddison *et al.*[6] in Britain found the reduction time with methylene blue was increased.

The effect on resazurin reduction has also been reported on. Thomas [20] found a considerable loss in resazurin-reducing ability. Galesloot [11] and also Revallier-Warffemius [18] reported a similar effect, which they attributed to the decreased activity of body cells. Frayer[10] also noted a definite retardation of activity. Thomas and Davies[21] however, found an increase of only 3 to 14 minutes in mean reduction times, which they regarded as insignificant.

The variable results noted probably reflect differences in the previous history of the milks, the presence or absence of the dye during the storage period, etc. Unfortunately, many of the papers fail to give sufficient details on these and other points. Furthermore, since the earlier studies were conducted, both the type and concentration of methylene blue have been changed and the periodical inversion of tubes during incubation has been adopted. The studies being reported in this paper were undertaken in the hope of providing more definite information concerning the influence of refrigerated storage under present conditions, using both methylene blue and resazurin tests[3]. Although the shorter incubation period of the latter generally obviates the need for holding samples overnight, the earlier colour changes shown by resazurin suggested the desirability of including studies with this dye.

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EXPERIMENTAL

Unless otherwise specified, the *Standard Methods for the Examination of Dairy Products*[3] were followed. Fresh dye solutions were prepared for each series of tests. In the main experiment weigh-can samples were obtained from milk of the first 20 shippers at each of 5 local dairies between May 8 and June 12, 1951. Some milk for manufacturing purposes was included, in order to obtain a wider range of reduction times. Half-pint bottles

were half-filled, and each batch of 20 brought to the laboratory immediately. No attempt was made to keep the samples cool between sampling and subdividing in the laboratory. After thorough mixing of the samples, 10-ml portions were rapidly pipetted into sterile 16x150 mm test tubes identified as follows:

Treatment	Methylene Blue	Resazurin
Control - Incubated at once	A	B
In ice water 2 hrs. then incubated	C	D
In ice water 23± hr. then incubated	E	F
In ice water 23± hr. then incubated	G[1]	H

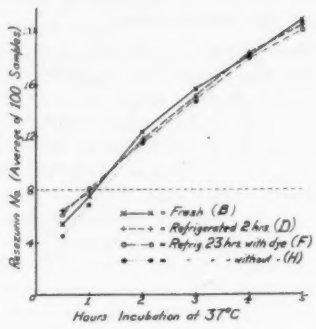
[1]This set was not prepared from the first series of 20 samples

For sets A to F inclusive, the dye solution was placed in the tubes before the milk was introduced: for sets G and H it was added immediately before starting incubation the following day. The ice water baths containing racks of tubes C to H, together with a further set for laboratory pasteurization, were held in a cold storage room at 3°C (37.4°F).

Approximately 5 minutes after placing the tubes in a thermostatically controlled water bath at 37°C they were closed with sterile rubber stoppers and each rack inverted 3 times to mix the milk and dye uniformly. Methylene blue tubes were examined every thirty minutes, with occasional further observations at 15-minute intervals; resazurin readings were recorded every 30 minutes for the first hour, then every hour. Munsell colour standards[3] were employed, and colour numbers recorded using the scale of Johns and Howson[14], where 0 is the initial colour, 16 a full pink, and 24 complete reduction. All tubes not showing obvious signs of reduction were inverted once each hour. In view of the more frequent observations, methylene blue reduction times were recorded for the exact period of incubation, rather than by the procedure outlined in Standard Methods[3].

RESULTS & DISCUSSION

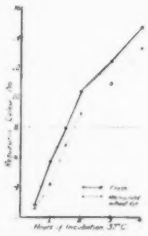
In figure 1 are shown curves representing the average resazurin colour number for all 100 samples at each reading for each of the four modifications (B, D, F, H) studied. Refrigeration overnight without the dye (H) had the greatest depressing effect on reduction during the first hour or two. The slightly greater colour change shown by the fresh milk (B) at the second and third hour may be attributable to non-bacterial reducing factors such as leucocytes (15) which tend to lose their reducing power when milk is stored in ice water, [11, 18, 20].


Resazurin No. (Average of 100 Samples)
Hours Incubation at 37°C
x——x = Fresh (B)
+---+ = Refrigerated 2 hrs (D)
o—o = Refrig 23 hrs with dye (F)
• • = without (H)

1. Average resazurin colour numbers from 100 samples of raw milk subjected to the treatments indicated.

These results are in line with those obtained here in previous studies on 20 samples tested in May, 1950, and 20 in February, 1951, data from which are presented in Figure 2. Here, after setting up the tubes for immediate testing, the remainder of each sample (*ca* 150 ml) was placed in the refrigerator and held for 24 hours; next day, 10-ml portions were pipetted out, the dye added, and incubation commenced. Despite their being warm (62°-68°F.) on arrival at the laboratory, and cooling down slowly in air, the reduction rate was slower following refrigeration.

Another method of measuring the effect of refrigeration is by comparing the numbers of samples placed in the several grades by the "triple reading" test[3, 14]. Table 1 suggests that resazurin reduction was slowed down by all three modifications of refrigerated storage and especially by overnight storage of the milk without the dye. Results following overnight storage with the dye present agree very well with those following 2 hour storage, although the grading with both modifications was more lenient than



2. Average resazurin colour numbers for 40 samples of milk examined in May, 1950, and February, 1951.

that for the "fresh" sample. However, application of the anaylsis of variance to these data revealed that at the 1% level there was no significant difference between the various treatments.

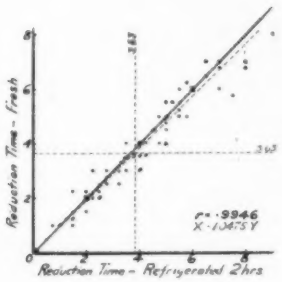
In figures 3, 4, 5 the results obtained with the several modifications of the methylene blue reduction test are presented as scatter diagrams so that the extent of variation can be more readily grasped. In these graphs the tubes incubated at once (A) were taken as the basis

TABLE I

EFFECT OF REFRIGERATED STORAGE ON GRADE BY RESAZURIN TRIPLE READING TEST

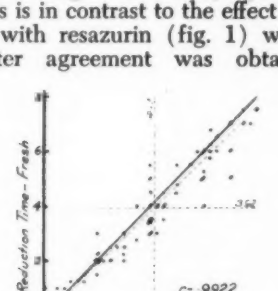
Treatment prior to incubation	% Distribution of Samples			
	Class 1	Class 2	Class 3	Class 4
B Fresh	19	23	24	34
D Refrigerated 2 hrs	25	21	23	31
F Refrigerated 23 hrs with dye	24	20	24	32
H Refrigerated 23 hrs without dye.	29	19	25	27

for comparison. The *average* reduction time for all samples is indicated by a dotted line, horizontal for the fresh and vertical for the refrigerated. Fig. 3 shows that reduction

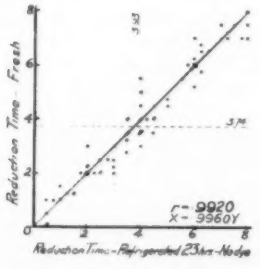


3. Corresponding methylene blue reduction times of fresh and iced milk samples.

time was prolonged slightly following even 2 hours refrigeration; after 23 hours the effect was more pronounced when the dye was present (fig. 4), but when stored without the dye (fig. 5) the effect was even less than that following the 2-hour storage with the dye present. This is in contrast to the effect noted with resazurin (fig. 1) where better agreement was obtained



4. Corresponding methylene blue reduction times of fresh and iced milk samples.

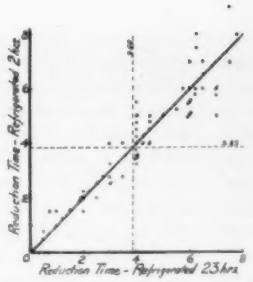


5. Corresponding methylene blue reduction times of fresh and iced milk samples.

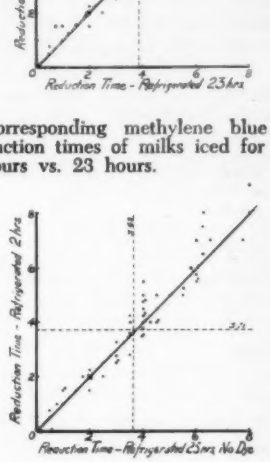
when the dye was present during overnight refrigeration.

Here again, despite the apparent differences, statistical anaylsis has revealed that in none of the three cases (fig. 3-5) is the calculated slope of the fitted equation $X = mY$ significantly different from the theoretical slope of 1.0000 which would be found if refrigeration caused no change in the reduction time of milk. The t values of 0.4097, 0.5338 and 0.0355 for the three sets of comparisons are also far below the values (2.64, 2.63 and 2.64) required for significance at the 1 percent level. The standard errors of the estimate are $\pm$ 0.2078, $\pm$ 0.2700 and $\pm$ 0.2513 respectively for the three comparisons, while the correlation coefficients are 0.9946, 0.9922 and 0.9920 respectively. It is concluded, therefore, that for these samples *there is no significant difference between the methylene blue reduction times for fresh and refrigerated milk.*

In actual practice, samples are not tested immediately but are held in ice water for varying periods. Consequently, the results obtained from portions iced for 2 hours are probably more representative of of those obtained in practice than are those from portions run immediately. Taking the former as the basis for comparison, the results are as shown in figures 6 and 7. Here it will be noted that the deviations are more evenly distributed on either side of the line denoting perfect agreement, with very little difference between the average values for 2-hour and 24-hour refrig-



6. Corresponding methylene blue reduction times of milks iced for two hours vs. 23 hours.



7. Corresponding methylene blue reduction times of milks iced for two hours vs. 23 hours.

eration. It would appear, therefore, that in actual practice overnight refrigeration has even less effect than was indicated in figs. 3-5.

The effect of the several modifications may also be studied by comparing the percentage distribution of reduction times. From the data in table II, it will be seen that the tubes refrigerated overnight without the dye (G) gave results in closest agreement with those from the tubes run immediately (A). Overnight refrigeration with

TABLE II

EFFECT OF REFRIGERATED STORAGE ON GRADING BY THE METHYLENE BLUE REDUCTION TEST

Treatment prior to incubation	No. of pairs	% Distribution of Reduction Times (hrs.)			
		6 & >	4 - 5½	2 - 3½	< 2
A Fresh	90	21.1	27.8	36.7	14.4
C Refrigerated 2 hrs		20.0	34.5	31.1	14.4
A Fresh	94	24.5	26.6	35.1	13.8
E Refrigerated 23 hrs with dye		31.9	30.9	24.5	12.8
A Fresh	80	22.5	23.8	30.8	15.0
G Refrigerated 23 hrs without dye		23.8	27.5	32.5	16.3

the dye (E) increased the proportion of samples requiring over 6 hours to reduce, while icing for 2 hours (C) increased the proportion reducing between 4 and 6 hours.

Ellenberger and Moody[7] reported that reduction times increased progressively up to a maximum of 65 minutes as the icing of samples was continued from 0 to 2 hours. To check on the effect of icing over this period, 40 more samples were obtained and 10-ml portions treated as indicated in table III. Since

TABLE III

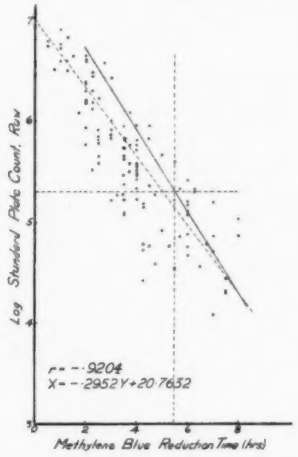
EFFECT OF REFRIGERATED STORAGE ON METHYLENE BLUE REDUCTION TIMES. 40 SAMPLES

Treatment	Average Reduction Time (hrs)
A Control - incubated at once	3.57
B Iced 1 hr. with dye	3.73
C " 1 hr. without dye	3.69
D " 2 hrs. with dye	3.69
E " 2 hrs. without dye	3.65

readings were made at 15-minute intervals, the results are more precise than those in the main experiment. They fail to confirm those of Ellenberger and Moody in that the 1-hour icing prolonged the reduction time on an average slightly more than did the 2-hour icing. Here again the presence of the dye shows a slight tendency to slow down subsequent reduction. However, grading on the basis of the classes used in table II shows very slight differences (table IV).

While differences in methylene blue reduction time as a result of refrigerated storage lack statistical significance, it seems preferable to minimize such differences by holding samples overnight without the dye being added. With resazurin however, if samples are to be stored overnight, the dye should be added before storage.

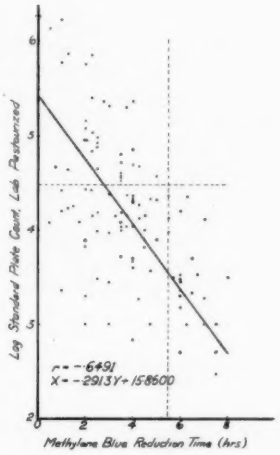
Incidental to the study of the effect of refrigerated storage, standard plate counts at 35°C (95°F) were made on the samples (a) as received at the laboratory, and (b) after laboratory pasteurization of 10-ml portions in open 16 x 150 mm test tubes in a thermostatically controlled water bath at 61.7°C (143°F) ± 0.5° for 35 minutes. Fig. 8 shows the relationship between raw plate counts and the



8. Log. plate counts vs. methylene blue reduction times for 116 milks.

methylene blue reduction times of the fresh milk. The solid diagonal line represents the relationship between these two tests specified in the revised Milk Ordinance recommended by the U. S. Public Health Service[8], while the dotted diagonal line represents the slope of the fitted curve when X = −0.2952Y + 20.7632. Although the number of samples -116- is not large, the agreement is surprisingly good, with a correlation coefficient of −0.9204. Had the high count samples been plated on a higher dilution, overcrowding would have been avoided and an even closer agreement obtained. It will be noted that only three samples with counts over 200,000 per ml failed to reduce methylene blue in 5½ hours.

In fig. 9 similar log counts, after laboratory pasteurization, are plotted against reduction times *when raw* for 112 milks, all but 20 of



9. Log. plate counts after laboratory pasteurization vs. methylene blue reduction times of raw milks (112 samples).

which were those shown in fig. 8, plus an additional 20 for which raw counts were not obtained. The horizontal and vertical dotted lines represent a count of 30,000 per ml and a reduction time of 5½ hours respectively, while the solid diagonal line indicates the slope of the fitted curve where X = −0.2913Y + 15.8600. In view of the popular opinion that thermoduric bacteria are unlikely to be detected by the dye reduction tests, it it is interesting to note that none of these milks with a plate count after laboratory pasteurization in excess of 30,000 showed a methylene blue reduction time, when raw, of over 5 hours.

TABLE IV

EFFECT OF REFRIGERATED STORAGE ON GRADING BY THE METHYLENE BLUE REDUCTION TEST. 40 SAMPLES

Treatment	% Distribution of Reduction Times (hrs)			
	6½ >	4 - 5½	2 - 3½	< 2
A Incubated at once	7.5	32.5	52.5	7.5
B Iced 1 hr. with dye	7.5	35.0	50.0	7.5
C " 1 hr. without dye	5.0	32.5	55.0	7.5
D " 2 hrs. with dye	5.0	32.5	52.5	10.0
E " 2 hrs. without dye	7.5	32.5	50.0	10.0

SUMMARY

Our findings confirm previous reports that storing tubes of milk in ice water between collecting and testing may affect the results of the dye reduction tests. With resazurin, the effect was greatest where tubes of milk without dye were stored overnight. When stored overnight with the dye present, the agreement with the controls was at least as good as that where tubes were refrigerated for 2 hours only. With methylene blue, however, the milks, without dye refrigerated overnight showed the closest agreement with the controls. Both the 2-hour and overnight holding with the dye slowed down the rate of reduction sufficiently to result in slightly more lenient grading than with the control. However, none of the differences were statistically significant, hence the 2-hour limitation for icing samples before testing does not appear to be justified.

Where it is difficult to conduct the test on the day of sampling, tubes of milk for the methylene blue reduction tests should preferably be stored overnight without the dye, whole those for the resazurin test should contain the dye.

The relationship between raw milk reduction times and plate counts (a) before and (b) after laboratory pasteurization was surprisingly good.

ACKNOWLEDGMENTS

The author is grateful to Mr. G. B. Oakland and Miss C. E. Cox of the Biometric Unit, Science Service, Department of Agriculture, for statistical advice and analysis of data, and to Misses B. Brawn and C. Darby and Messrs. T. W. Humphreys and J. G. Desmarais for technical assistance.

REFERENCES

1. Abele, C. A. Personal communication, April 12, 1951.
2. *Standard Methods for the Examination of Dairy Products*, 7th ed. American Public Health Association, New York, N. Y., 1939.
3. *Ibid.* 9th ed. 1948.
4. Arup P. *Analyst*, **43**, 20-31 (1918).
5. Calbert, H. E. & Wallenfeldt, E. *Wis. Stencil Circ.* 304 (1949)
6. Eddison, R. T., Kempthorne, O., Hosking, Z., Barkworth, H., Cox, C. P. and Rowlands, A. *J. Dairy Res.* **18**, 43-71 (1951).
7. Ellenberger, H. B., and Moody, R. J. *Vt. Agric. Expt. Sta. Bull.* 312 (1930).
8. *Revised Milk Ordinance Recommended by the U. S. Public Health Service.* Federal Security Agency. April 1949.
9. Frayer, J. M. *Vt. Agric. Expt. Sta. Bull.* 374 (1934).
10. Frayer, J. M. *Ibid.* 435 (1938).
11. Galesloot, T. E. *Netherlands Milk and Dairy J.* **2**, 70-90 (1948).
12. Johns, C. K. Unpublished data (1937).
13. Johns, C. K. *Sci. Agr.* **19**, 435-457 (1939).
14. Johns, C. K. and Howson, R. K. *J. Milk Technol.* **4**, 320-325 (1940).
15. Johns, C. K. *15th Ann Rept. New York State Assoc. Dairy & Milk Insp.* 173-185 (1941).
16. Morton, R. K. and Vincent, J. M. *J. Dairy Res.* **16**, 310-321 (1949).
17. Phillips, R. and Thomas, S. B. *Welsh J. Agr.* **15**, 150 (1939).
18. Revallier-Warffemius, J. G. *Netherlands Milk and Dairy J.* **1**, 152-165 (1947).
19. Smythe, V. R. *Queensland J. Agr. Sci.* **2**, 128-156 (1945).
20. Thomas, S. B. *Proc. Soc. Agric. Bact.* 1-2 (1941).
21. Thomas, S. B. and Davies, M. *Welsh J. Agr.* **16**, 231-247 (1940).
22. Thornton, H. R. Personal communication June 25, 1951.
23. Wallenfeldt, E. Personal communication, April 5, 1950.
24. Wilson, G. S. *The Bacteriological Grading of Milk.* Medical Research Council, London, Spec. Rept. 206, 1935.

WISCONSIN FIELDMEN'S CONFERENCE

The annual Dairy Plant Fieldmen's Conference will be held on the University of Wisconsin Campus at Madison on February 7 and 8, 1952.

On the morning of February 7 at 11:00 o'clock it is planned to dedicate Babcock Hall, the new Dairy and Food Industries Building. Fieldmen who attend this conference will therefore have an opportunity of being present at the Dedication Ceremonies. It is planned to hold Open House at Babcock Hall on the evening of that day.

During that week, on Wednesday afternoon, February 6, another program is being held which will be of considerable interest to fieldmen. This relates to discussions on Brucellosis. All fieldmen are invited to attend it, as well as the regular Fieldmen's Conference on Thursday and Friday, February 7 and 8.

What Effect Does Grass Silage Have on Quality of Milk and Milk Products? By W. V. Price, Department of Dairy and Food Industries

Cow Barn Ventilation: By C. H. Neitzke, Department of Agricultural Engineering.

The Milkhouse Problem:

The Milkhouse Regulation: By H. J. Weavers, Dairy Division, Wisconsin Department of Agriculture.

Getting Action: By William Kasakaitas, Wisconsin Farm Bureau Federation.

Plans and Costs: By M. J. LaRock, Department of Agricultural Engineering.

Financing Milkhouses: By Jim Judd, Consolidated Badger Cooperative.

Questions and Answers by Panel of Speakers.

The conference program follows:

Effects of Mastitis on the Cow: By S. M. McNutt, Department of Veterinary Science.

Causes and Prevention:

Bacterial Phases: By E. M. Foster, Department of Bacteriology.

Management Phases by V. R. Smith, Department of Dairy Husbandry

Control of Mastitis:

Tests and General Control: By J. Simon, Department of Veterinary Science.

Organized Programs: By C. A. Brandly, Department of Veterinary Science.

The Mastitis Problem as it Affects the Dairy Plant: By H. E. Calbert, Department of Dairy and Food Industries.

Questions and Answers: By Panel of Speakers.

Evening Program

"Open House" at Babcock Hall.

REPORT OF COMMITTEE ON FOOD EQUIPMENT

*For the Year ending September 26, 1951**

Your Committee on Food Equipment Standards is pleased to report that they have made some real progress during the past year. The development of sanitary standards for all the types and varieties of equipment used by the many branches of the food industry is a tremendous undertaking. It can only be accomplished by the wholehearted and diligent effort of all those desirous of obtaining this worthwhile goal. It calls for an unprecented cooperation and a sincere desire to resolve individual difference of opinion by both public health organization representatives and industry representatives.

Accomplishments to Date

On September 6, 7, and 8, 1950 at the invitation of the National Sanitation Foundation, the representative of this association and four other national associations of public health and sanitation, and the U. S. Public Health Service, met at Ann Arbor, Michigan. At this meeting, these representatives drafted a charter for a Joint Committee on Food Equipment Standards to function within the framework of the National Sanitation Foundation. The preliminary draft of that charter was included in last year's Annual Report. This charter was approved after slight modifications and adopted early in this fiscal year. Both industry and official agencies and organizations have a democratic voice and responsibility in promulgating, adopting, and securing national acceptance of sanitary standards of all types of food handling equipment.

Industry Task Committees prepared and submitted tentative standards to the Joint Committee† for review and constructive criticism in September 1950. Standards for Soda Fountains & Luncheonette Equipment, Food Service Equipment, and Spray-type Dishwashing Machines have been considered during the year. Their present status is as follows:

Soda Fountain and Luncheonette Equipment

On May 7, 1951, the Chairman of your Committee notified the Secretary of the Joint Committee on Food Equipment of the National Sanitation Foundation that the fourth draft of this standard was acceptable to a majority of the committee members. Some members still believed that further improvements could be made, but that it would be of more value to come out with the first standard so that all members of all participating organizations would have an opportunity to study it and try it out under practical field conditions. The Joint Committee agreed to reconsider and amend it if after a year of field trial the experience gained indicated and warranted constructive changes. In view of the fact that such standards will not carry the endorsement of our Association until accepted by a majority of all members voting at an annual business meeting, it would appear logical that they be accepted by your committee without necessarily having the last i dotted and the last t crossed. The other five participating committees have also accepted the Soda Fountain and Luncheonette Standard. It has been adopted by the National Sanitation Foundation and is being prepared for the printer.

Food Service Equipment

Acceptance of the third draft of this standard was indicated by a majority of the members by mail during the month of August 1951, but because replies had not been received from all members, and because we met for the first time this year, only last night, notification of acceptance of this standard has not been made to the Secretary of the Joint Committee. This standard has also been accepted by the majority of the participating committees.

Spray-type Dishwashing Machines

Standards for equipment of a type which performs a function of cleaning other equipment or utensils are far more complicated than standards that pertain only to the sanitary design of the equipment in question. The same degree of complexity and certain functional features are common to washers, whether they be for dishes, bread and cake pans, meat trays, bottles or cans. The task committees, representing each of these industries, are all having difficulty in drafting standards for washers. If the standard is too specific, ingenuity and progress may be stifled. If they are too general, the manufacturer, buyer and sanitarian may each place his own and a different interpretation on the specifications with the result that we do not have a standard. It may be necessary to include or append a performance test, carried out under standard test conditions. The second draft of this standard is now being considered but it appears that it will require considerable study and revision before attaining acceptable status.

Baking Industry Sanitary Standards Committee

The baking industry has also initiated a program for the development of sanitary standards for equipment used in this industry but has approached their problem in a little different manner from that of most other food industries. They have a very active and energetic committee on sanitation. Instead of attempting to develop one standard at a time, they have assigned task committees for each and every similar type of equipment used in the industry. For the past two years, they have been working intensively and simultaneously on a number of standards.* Up to the present time they have asked for and received the cooperation and guidance of consultance of the U. S. Pure Food and

(continued on page 14)

†1. U. S. Public Health Service—Milk & Food Branch
2. International Association of Milk & Food Sanitarians, Inc.,—Committee on Food Equipment
3. National Association of Sanitarians —Committee on Food Equipment
4. American Public Health Association Engineering Section—Committee on Food Equipment.
5. Conference of State Sanitary Engineers—Committee on Food Equipment
6. Conference of Municipal Public Health Engineers—Committee on Food Equipment

* Presented at 38th Annual Meeting of the International Association of Milk and Food Sanitarians, Inc., at Glenwood Springs, Colo., Sept. 26, 1951.

3A SANITARY STANDARDS OF PLATE TYPE HEAT EXCHANGERS FOR MILK AND MILK PRODUCTS

FORMULATED BY
INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS

United States Public Health Service
The Dairy Industry Committee
As of September 1951

It is the purpose of IAMFS, US PHS, and DIC in connection with the development of the 3A Sanitary Standards program, to allow and encourage full freedom for inventive genius or new developments. Plate Type Heat Exchanger specifications which are developed and which so differ in design, material, construction, or otherwise, so as not to conform with the following standards, but which in the opinion of the manufacturer or fabricator are equivalent or better, may be submitted at any time for consideration of IAMFS, USPHS, and DIC.

3A SANITARY STANDARDS FOR PLATE TYPE HEAT EXCHANGERS

A. MATERIAL

1. All metal exchanger parts having any surface in contact with the product shall be constructed of dairy metal consisting of stainless steel, or equally corrosion resistant material that is non-toxic and non-absorbent.

a. All milk contact surfaces shall be equivalent to not less than 120 grit finish properly applied.

b. All outside surfaces shall be smooth and readily cleanable.

2. Exteriors of presses (or frames) including the follower block, terminal frames, and closing mechanism, that do not come in contact with the product, shall be of corrosion-resistant material with a smooth finish, or shall be rendered corrosion resistant, or painted with a corrosion resistant paint, and shall be so constructed as to be readily cleanable.

B. CONSTRUCTION

1. All milk contact and exterior surfaces shall be accessible or readily removable for cleaning and inspection. Heat transfer plates or gasket frames shall be readily removable from the press. Individual removable heat transfer plates or gasket frames will be considered as complying.

2. Presses (or frames) shall have smooth exterior surfaces, including bottom, and shall be self-draining. They shall be provided with legs which give at least four inches clearance between lowest part of frame and the floor. Legs shall be smooth with rounded ends and no exposed threads. Legs made of hollow stock shall be sealed.

3. Threads shall not be used in contact with the product.

4. All surfaces in contact with the product shall have smooth rounded corners having radii as large as possible for practical operation and shall be readily accessible for cleaning.

5. Product contact spaces on any given plate surface shall be separated from heating and/or cooling spaces by a leak protector goove or sufficient width to be readily cleanable and open to the atmosphere at both ends.

6. Presses (or frames) shall be so constructed that when opened plates and/or terminal frames will be separable to provide a space for ease of cleaning and inspection equal to at least the width of one plate. but need not exceed fifteen inches.

C. OPENINGS

1. Product inlet and outlet fixed connections shall conform with structural design of 3A sanitary fittings and shall be of stainless steel or equally corrosion resistant materials.

D. GASKETS

1. Transfer surface gaskets shall be continuous, and of a removable sanitary type, or a rubber-like material continuously bonded to the transfer surface so as to be smooth and readily cleanable.

2. Gasket material shall be non-toxic, relatively fat resistant, and non-absorbent, and shall have a smooth surface.

REPORT OF COMMITTEE ON FOOD EQUIPMENT

(continued from page 13)

Drug Administration, the U. S. Public Health Service, the health departments of several large cities, and our own Association. They have been offered the collaboration of our Committee and have recently submitted some of the second and third drafts to each member of our Committee, for study. This emphasizes the need for the enlargement of this Committee with personnel who are especially experienced in the sanitation problems of the baking industry as well as other major food industries.

It is hoped that the Baking Industry Sanitary Standards Committee will ask for the full collaboration of our Committee in the development and approval of all their standards and final endorsement by our Association. However, before offering our cooperation, it is essential that we add to our committee members who are especially experienced in the sanitation problems of the baking industry.

*Baking Industry Sanitary Standards Committee Standards under consideration —

Cake depositor, fillers and icing machines
Ingredient water coolers
Pan, rack, utensil washers and industrial sinks
Flour storage bins
Dough Troughs
Ingredient-handling equipment
Mixers - horizontal
Proofers
Draw Proofers
Mechanical Proofers
Bucket Elevators
Electric Motors
Flour Sifters
Screw Conveyors
Air Activated Conveyors
Drag Type Conveyors
Cut-off gate
Flour Whey Hoppers
Dump Bins and Blinders

REPORT OF THE COMMITTEE ON MILK REGULATIONS AND ORDINANCES*

* Presented at Thirty-seventh Annual Meeting of the International Association of Milk and Food Sanitarians, Inc., Atlantic City, N. J., Oct. 13-16, 1950.

The committee report on milk regulations and ordinances is of necessity in the form of a progress report. A brief review of the committee action over the past three years, however, appears to be appropriate.

In 1947, the committee recommended an ordinance similar to the tentative revised edition of the milk ordinance recommended by the U. S. Public Health Service, as the nearest approach that could be made at that time to a generally acceptable set of standards and recommendations that would meet the stipulation of the motion establishing the committee. It was recommended that it be mimeographed and mailed to the members of the association at an early date for comments and suggestions. This was done rather late in 1948, with the result that the report for that year was mainly a progress report, stating that 50 members had submitted opinions, criticisms, and recommendations for changes in the ordinance.

The 1949 committee, however, summarized the replies which had increased to 59. The ordinance, as submitted, contained 18 sections. Of these, the following 7 sections received no comments or suggestions:

Section 8, "Grades of Milk and Milk Products, which may be sold,"

Section 9, "Reinstatement of permit,"

Section 11, "Milk and Milk Products from Points Beyond the limits of routine inspection,"

Section 13, "Notification of disease,"

Section 15, "Enforcement interpretation,"

Section 17, "Repeal and date of Effect," and

Section 18, "Unconstitutionality clause."

The remaining eleven (11) sections were commented on to the following extent:

Section 1, "Definitions," contained 31 definitions. Criticisms and suggested changes were received for 19 of the definitions.

Section 2, "The sale of adulterated, misbranded, or ungraded milk or milk products prohibited"—two suggested changes.

Section 3, "Permits"—three suggested changes.

Section 4, "Labeling"—five suggested changes.

Section 5, "Inspection of Dairy farms and milk plants"—six suggested changes.

Section 6, "The examination of milk and milk products"—7 suggested changes.

Section 7r, "The grading of milk and milk products" contained 26 items. The 3 items in this section that did not receive one or more criticisms were 9r, "Milk house or room cleanliness and flies," 14r, "Utensil, bactericidal treatment," and 15r, "Utensil, storage."

Section 7p contained 23 items. Fifteen of these items received one or more criticisms.

Other sections, Section 10, "Transferring or dipping milk, delivery containers, etc.," Section 12 "Future dairies and milk plants," Section 14, "Procedure when infection suspected," and Section 16, "Penalty clause," each received one suggested change.

After considering these suggestions, many of which were controversial and confusing, the committee of 1949 decided that it would be impractical to attempt at that time to rewrite the ordinance submitted in 1948 into an acceptable form.

With the aid of members of the dairy industry and others, it therefore, drafted a tentative form of an ordinance which placed greater emphasis upon pasteurization and greater dependence upon platform inspection than the ordinance previously submitted. This ordinance became a part of the 1949 report of the committee. It was suggested that it be published in the *Journal of Milk and Food Technology* and that comments and suggestions be solicited from all interested parties.

It was the thinking of the majority of the members of the 1949 committee that placing before the members an ordinance contrary in many respects to the one recommended by the U. S. Public Health Service would permit those opposing the latter ordinance to express more readily their views. It was also hoped that it would show that the two factions were not as far apart as appears from the comments received on the previously submitted ordinance. Furthermore, it was hoped that a thorough study and correlation of the comments received regarding the two types of ordinances would enable the committee better to formulate an ordinance which would be acceptable to a majority of our membership.

The 1949 report was published in the *Journal of Milk and Food Technology,* **13,** March–April (1950).

Changes were made in the Committee membership for 1950. Mr. C. A. Abele who had served continuously and ardently on this committee since its inception, due to pressure of other work, could not continue as a member. He was, therefore, replaced by Dr. C. K. Luchterhand of the Board of Health, State of Wisconsin. Mr. A. W. Fuchs, of the U. S. Public Health service had, prior to 1949, been a member of the committee. Upon assuming the office of the presidency, he appointed Mr. W. N. Dashiell of the U. S. Public Health Service to represent that service. Upon completing his term of presidency, Mr. Fuchs returned to the committee in place of Mr. Dashiell.

Time has not permitted a complete study and tabulation of the comments received regarding the 1949 report. A total of 37 replies were received as of September 25. As was the case with the first ordinance submitted, nearly every section of this proposed ordinance was commented upon. It is unfortunate that a large proportion of the replies do not contain detailed criticisms. In fact, 20 of the 37 replies failed to make such criticisms. Of these 20 replies, 5 commended the committee on its work and the other 15 simply expressed favor for the ordinance recommended by the U. S. Public Health Service. Of the 37 replies, 22 were apparently in favor of the U. S. Public Health Service Ordinance and the remaining 15 were apparently in favor of an ordinance which stressed platform inspection and pasteurization. A further breakdown of these replies showed that of the 22 in favor of the U. S. Public Health Service Ordinance, 12 were written by representatives of State Departments of Health, 5 by representatives of City Departments of Health, 4 by representatives of the U. S. Public Health Service, and one by an individual. A report of the National Conference on Interstate milk shipments, July 1, 1950, was also received. Of the 15 replies favoring greater interests in platform inspection, 6 were from individuals, 3 from representatives of state departments of health, 3 from representatives of state

colleges, one representing a state association, one representing a city department of health and one a popular dairy publication. The most constructive reply received was the one reporting the work of the Ordinance Committee of a State Sanitary Association which had gone over the ordinance step-by-step and made suggested changes therein.

Replies received regarding the 1947 and 1949 reports that are of a constructive nature could be the basis of revising whichever ordinance as shown by a study, is best adapted to revision. It is, therefore, recommended that this committee be continued on an active status to formulate an ordinance on the above basis and submit it for comments and suggestions. It is desired to remind the association members that a committee report does not constitute acceptance, promotion, rejection, or condemnation of any given ordinance and that it is the purpose of this committee to formulate an ordinance satisfactory to the greatest number and not to foster or promote any ordinance now in existence. It is further recommended that this association delay the promotion of any ordinance until after the study of milk regulations and ordinances by the National Research Council is completed.

Insofar as time would permit, the comments of committee members, A. W. Fuchs, O. A. Ghiggoile and C. S. Leete have been incorporated in this report. No comments were received from H. L. Delozier, H. A. Dunsmore, or C. K. Luchterhand.

C. J. BABCOCK, *Chairman*

EASILY CONSTRUCTED TIME SAVING APPARATUS FOR FILLING DILUTION BOTTLES*

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East Lansing, Michigan

The hand filling of dilution bottles which are used in the enumeration of bacteria by the plate count method is a tedious and expensive task. Below is described an accurate, easily constructed, inexpensive apparatus for filling 350 to 400 dilution bottles per hour.

The apparatus shown in Figure I is as follows. C and C¹ are 100 ml volumetric pipettes with their tips cut off. D and D¹ are three-way stopcocks with 4 mm double oblique bores. The two parallel arms of D and D¹ are cut off to a length of about 3 cm. G is a rubber tube leading to an overhead supply of gravity-fed diluent. E and E¹ are T's with an internal diameter of 6 mm. They connect the pipettes C and C¹ with the stopcocks D and D¹. H is a short length of rubber tubing which is introduced into the bottle to facilitate filling. B and B¹ are T's of 6mm internal bore. They are so adjusted that any diluent in excess of the desired amount will be drained off. A and A¹ are elbows of 7 mm internal bore glass tubing. F, F¹, F¹¹ and F¹¹¹ are lengths of of rubber tubing leading to a drain. Connections between stopcocks, pipettes, T's, and elbows are made with short lengths of rubber tubing.

Operation of the apparatus is very simple. Stopcock D can be turned to fill either C or C¹, while concurrently, stopcock D¹ can be used for emptying C or C¹. Thus, while one pipette is being filled from the overhead reservoir the other can be emptying into a dilution bottle.

Analysis of fifty square, six-ounce dilution bottles filled by means of the above apparaus and weighed to the nearest desigram showed a mean volume of 101.1 ml and a standard deviation of 0.39 ml. Therefore the volume of diluent will be within 0.39 ml of the desired volume 68 per cent of the time and within 1.2 ml 99.7 percent of the time.

Autoclaving results in a considerable loss of water. When these bottles were lightly stoppered with Escher stoppers (See Fig. 3b, p. 88) and autoclaved, 25 in a wire basket, for 25 minutes at 121° C, with periods of 3 minutes for the autoclave to reach 121° C and 24 minutes to cool to 100° C, the mean loss and standard deviation were 3.5 ml and 1.0 ml respectively. In order to compensate for water lost in autoclaving for 25 minutes in an unjacketed, uninsulated autoclave, the bottles should be filled with 102.5 ml. This can easily be done by calibrating the pipettes C and C¹ to deliver 102.5 ml.

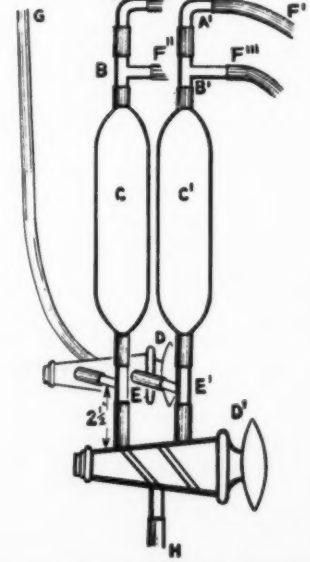

FIG. 1 APPARATUS FOR FILLING DILUTION BOTTLES

Mr. Hilliard Pivnick graduated from the Ontario Agricultural College specializing in bacteriology. He received his M. S. degree from Dalhousie University, Halifax, Canada, where he spent three years with the Fisheries Experimental Station of the Fisheries Research Board of Canada. At present he is working in the laboratory of Dr. F. W. Fabian, Michigan State College, as an industrial research fellow. He expects to receive his Ph. D. in January, 1952, and then teach food and sanitation bacteriology at the University of Nebraska.

* Journal Article No. 1251

1. *Standard Methods for the Examination of Dairy Products.* Ninth Edition, American Public Health Association, New York, 1948.

REPORT OF THE COMMITTEE ON COMMUNICABLE DISEASES AFFECTING MAN

INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS *

* Presented at the Thirty-seventh Annual Meeting of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC., Atlantic, N. J. October 13-16, 1950.

Many diseases of both human and animal origin may be transmitted to man through the consumption of contaminated milk and food. The list of such diseases is long, and includes, among others, brucellosis, bovine tuberculosis, typhoid and paratyphoid fever, diptheria, food poisoning, septic sore throat, Q fever, dysentery, diarrhea and enteritis, and trichinosis.

The latest report of the U. S. Public Health Service on the disease outbreaks conveyed through water, milk, and other foods as compiled from reports submitted by the various states and cities, shows that in 1948 there was a total of 11,660 cases in 375 such outbreaks. Of these, 21 outbreaks were traced to water, 17 to milk and milk products, 327 to other foods and 10 to undetermined sources. An interesting observation in connection with the milk-borne disease outbreaks is that all of the 8 outbreaks attributed to pasteurized milk and milk products were due to the improper handling of these products after pasteurization. Of interest in connection with the outbreaks from food other than milk and milk products is that 107 outbreaks were from meat and meat dishes, 61 from poultry and poultry dishes, 41 from cream pastries, 24 from salads, puddings, and creamed sauces, and 22 from fish and fish dishes. Fourteen outbreaks of trichinosis were reported.

During the period 1938–1948, there were 3,077 disease outbreaks reported in the United States which were traced to milk and food. There were 120,137 cases and 522 deaths. In addition, at least 48,000 cases of brucellosis occurred during the same period, resulting in 940 deaths. Studies indicate that one-third to one-half of these cases of undulant fever were transmitted through the consumption of contaminated milk.

Unfortunately the figures given above represent but a fraction of the outbreaks and cases of milk-borne and food-borne diseases that actually occurred because, among other things, many thousands of cases of disease transmitted through milk and food occur as individual or sporadic cases most of which are not reported, and only a small number of states require the reporting of food poisoning and food infection.

It is not possible to discuss all of the diseases which are transmitted by milk and other foods. In this report certain contemporary problems are chosen for further discussion.

MILK AS AN EPIDEMIOLOGICAL FACTOR IN Q FEVER

Q fever may be defined as a specific systemic infection of man due to *Coxiella burneti* (*Rickettsia burneti*).

Derrick [1] first described the disease in Australia during 1937 and looked upon it as an occupational hazard affecting workers in packing houses. Recent research [2] suggests five modes by which the infection is spread, namely: (a) occupation in the live stock and packing industry, (b) residence within one-fourth mile of such industries, (c) use of raw milk and raw milk products, (d) human contact, (e) tick bites.

For practical purposes we may group all of these modes of spread under two main heads, (A) air borne and (B) the consumption of raw milk and raw milk products. We will limit our discussion to the latter.

The factors incriminating milk may be summarized as follows:

(a) *Coxiella burneti* has been recovered from raw milk and from the products of raw milk particularly butter.[4]

(b) in the Los Angeles County area there is an endemic focus where the organism has been recovered from the pooled raw milk of 40 of 63 dairies tested. In this locale it has been estimated that somewhat less than 5 percent of the population consumes raw milk.[6] From a mass survey of the result of complement-fixation testing of a representative sample of the population, it is estimated there are 50,000 persons in this area who have been infected with Q fever. Also in this area more than 300 cases of clinical Q fever have been reported since January 1, 1947.

While these factors do not directly incriminate the consumption of raw milk as the major causative factor, it is highly suggestive when compared to the fact that in San Francisco, where all market milk is pasteurized, there was only one local case reported over the same period of time

There have been some interesting paradoxical observations made on the recovery of *Coxiella burneti* from cows. Huebner [4] was able to recover the organism with regularity from the milk of infected animals but the blood, urine and feces of these same subjects failed to yield the organism. From his experience it would appear that the disease in cows is confined to the udder and is not a systemic disease as seen in man. If this were true it would be difficult to explain the heavy contamination of dust which is probably the big factor in the air-borne spread of this disease.

However, recently, Dr. John Enright [5] working at the University of California at Davis, has shown that in the late part of gestation there is a systemic distribution of the organism in the cow and *Coxiella burneti* are shed in the urine and feces.

From the foregoing discussion it is evident that raw milk is at least an important reservoir for the spread of the disease. The efficacy of pasteurization of milk contaminated with *Coxiella burneti* has been studied by Huebner [7] and associates. This group has demonstrated several important findings. First, that the resistance of *Coxiella burneti* to heat is much greater than that of other rickettsias and even exceeds that of most vegetative bacteria. The organism may survive a temperature of at least 60° C for 30 minutes in sealed vials. Second, in testing the two common types of pasteurization, namely the holding vat method and the high-temperature short-time method (HTST), they found, in carefully controlled testing of such pasteurization on naturally infected milk, that 6.2 percent of the guinea pigs inoculated with the product of the holding vat method were infected while none of those tested with samples of the HTST processes reacted positively. These results occurred even in the absence of phos-

phatase in the testing of samples which is used as an indicator of effective pasteurization. Later work, however, shows that the *Coxiella burneti* organisms survived in milk pasteurized in both vat type and HTST pasteurizers.

Because of the heat resistant properties of this organism, the safety factor of our accepted methods of pasteurization must fall in a rather narrow range, as the survival rate at 60° C is very close to the optimum temperature prescribed in the California code.

For these reasons, Dr. Enright is about to make a rather extensive survey of the question of pasteurization as related to Q fever.

In summarizing the foregoing remarks, it may be concluded that in certain endemic areas, raw milk and raw milk products are a potential reservoir of infection. Also, that because of the resistance of the organism to heat, we may be forced to change our concepts of the safety of our present pasteurization processes.

BOVINE MASTITIS

This disease still holds a prominent place in its relationship to milk and other food-borne outbreaks of disease. This is particularly true of staphylococcal mastitis. The role of *Micrococcus pyogenes* var. *aureus* in initiating cases of enterotoxemia is well known. That this organism is found in the great majority of the cases of mastitis is likewise generally acknowledged. Unfortunately this organism does not respond to antibiotic treatment as readily as the mastitis streptococci; consequently it persists in the herd after treatment in many instances. The presence of this organism in milk supplies should receive serious attention and milk from herds where such infection persists should not be used for human consumption.

USE OF ANTIBIOTIC AGENTS

Although the discussion of this subject is somewhat outside the function of this committee, it is believed that it should receive comment.

The antibiotic agents, particularly penicillin and aureomycin are widely used by veterinarians and by dairy owners in the treatment of mastitis. In many instances the milk from treated animals is not withheld from market long enough after treatment for the dissipation of the drug used. It is well known that this procedure creates problems in cheese factories and in the preparation of culture milk. It also creates a problem in laboratories depending on the bacteria count as an aid to sanitary control. Unfortunately, the use of antibiotics has been suggested as an aid in controlling the bacteria count in milk, a practice which this association should actively oppose.

It is desirable to call attention to some of the far-reaching and serious consequences of the persistence of these antibiotics in a milk supply. First, medical literature is full of reports concerning the sensitivity of individuals to antibiotic agents. In many cases this sensitivity does not follow the prior use of the antibiotic. It is apparent that the presence of an antibiotic in milk would be an excellent means of producing sensitivity in people. The serious consequence of marked sensitivity, obviously, is the fact that in case of very severe illness the antibiotic cannot be used in very sensitive individuals. Often this is a matter of life or death. Second, it is well known that bacteria develop a tolerance to antibiotic agents, in fact, completely resistant strains of most of the bacteria usually considered sensitive, are often encountered. If resistant strains are produced by contact with the antibiotic, it can be easily seen that the more widespread the antibiotic, the greater the probbility that antibiotic-resistant strains of pathogenic bacteria will be developed. The consequences are the same as noted above. Diseases produced by antibiotic-resistant strains of bacteria would not respond to treatment at the time of serious illness.

In view of the above possibilities, the presence of an antibiotic in milk should be considered to be adulteration.

REFERENCES

1. Derrick, E. H. Q Fever: a New Fever Entity. Clinical Features and Laboratory Investigations. *Med. Jr., Australia*, Aug. 21, 281–296 (1937).

2. Deutsch, D. G. and Peterson, E. T. Q Fever. Transmission from One Human Being to Others. *J. Amer. Med. Assn.*, **143**, 348 (1950).

3. Topping, N. H., Shepard, C. C. and Irons, J. V. Q Fever in the United States: Epidemiological Studies of an Outbreak among Stock Handlers and Slaughterhouse Workers. *Ibid.* **133**, 813–815 (1947).

4. Jellison, W. S. *et al.* Q Fever Studies in Southern California. Recovery of *Coxiella burneti* from Butter Made from Naturally Infected and Unpasteurized Milk. *Pub. Health Rep.*, **63**, 1712 (1948).

5. Personal Communications, Dr. John Enright.

6. Huebner, R. S., Unpublished data.

7. Huebner, R. S. *et al.* Q Fever Studies in Southern California. III. Effects of Pasteurization on Survival of *Coxiella burneti* in Naturally Infected Milk. *Pub. Health Rep.*, **64**, 499 (1949).

I. A. Merchant, *Chairman*
R. G. Flood
J. G. Hardenbergh
R. J. Helvig
C. K. Mader
E. R. Price

TECHNICAL SCHOOL FOR PICKLE AND KRAUT PACKERS

Michigan State College, East Lansing.

February 19, 20, 21, 1952

The Technical School for Pickle and Kraut Packers will be held on February 19, 20, and 21 in the "Kellogg Center for Continuing Education". Last year over 70,000 people attended adult education courses on the campus and this year plans are made for over 130,000 to attend such courses. The unique feature about the building is that you eat, sleep, and are educated in the same building. The program will be conducted by Professor F. W. Fabian, Department of Bacteriology and Public Health.

NATIONAL CONFERENCE ON INTERSTATE MILK SHIPMENTS JUNE 4-6, 1951

J. L. ROWLAND, *Chairman*
Missouri Division of Health, Jefferson City, Missouri

HISTORY OF THE INTERSTATE MILK SHIPMENT PROBLEM

The sanitary quality of milk shipped interstate, as well as intrastate, has been a matter of concern to receiving areas for many years. In spite of the fact that concerted efforts had been made to establish a uniform milk control program for our nation, failure of some states to realize the value of such a uniform program developed a condition which adversely affect the consumer, the dairy industry, and the milk control officials.

Lack of a uniform approach to a solution of the problem has resulted in the creation and continuance of a confusing condition in milk sanitation. Failures to adopt recognized uniform standards, differences in interpretations by state and municipal enforcement agencies, and the experience of areas receiving poor quality milk resulted in a feeling of apprehension on the part of the receiving authorities. Consequently, officials of the receiving areas, in order to secure good milk supplies, insisted on making inspections of the milk plants and dairy farms in the producing areas. This system of supervision invariably caused multiplicity of inspection, and along with it, the application of regulatory standards of a wide variety of requirements caused confusion and misunderstanding. This system was costly to the receiving areas, it created ill-feeling between official agencies and caused industry to conclude that there was little coordination between milk control agencies—a belief amply supported by established facts.

Unfortunately, some local areas have used milk regulations for the erection of trade barriers. Occasionally, geographical restrictions have been used to limit inspection areas. This restriction of inspection has, without exception, been declared illegal by the federal courts having jurisdiction over interstate commerce. Therefore, inspection of milk sources beyond the limits of routine inspection is a problem. Some local regulations also include provisions with limited bearing on public health, yet used under the guise of health protection to exclude acceptable milk from adjacent areas within the same state. It should be obvious that the American belief in free enterprise is being flouted in such instances and public health protection given a minimum of consideration.

In periods of stress, artificial trade barriers break down. During floods, devastating wind storms, and other incidents where population shifts are made, local available milk supplies seldom are available in sufficient quantity to meet demands. During these emergencies, milk may be secured from interstate and intrastate sources. Following these critical periods, industry and the public frequently demands to know why—"Milk good enough to use then is not good enough to use in the future." This situation inevitably causes confusion and antagonism toward milk control programs, a condition which could be avoided by the establishment of acceptable sources of quality milk that could be used at any time.

A classic example of the changes brought about by emergencies is furnished by the events of World War II. The outbreak of hostilities saw tremendous shifts in population. Industrial plants were greatly expanded and new plants were erected in other areas. Army, Navy and Air Corps training camp sprang up all over our nation. Milk was made a part of armed forces' rations and employees of manufacturing plants were encouraged, because of the recognized beneficial results, to drink milk during rest periods and with their meals. This increase in the demand for milk caused industry, procurement officials of the armed forces, and health officials, to scour the country for milk complying with fundamental quality standards. In short, there was not a sufficient amount of clean safe milk to meet the demands of our people. This war-time condition is not too different from the situation found today, as in many areas of our country, the supply of acceptable milk does not meet the demand. Consequently a blend of poor quality with good quality milk may be made under the guise of compliance. The industry, the public and the milk control officials all suffer from such a condition.

As a matter of fact, while the desirability of providing approved sources of milk, to balance the area of need with the area of supply, had been under discussion for some time, the impact of World War II awakened the receiving and producing states the importance of establishing a system to facilitate the receiving states in locating, and the producing states in shipping, supplies of milk and milk products of high sanitary quality.

Availability of milk supplies which comply with the fundamental standards for milk of high-sanitary quality will assist in the improvement of the situation by (1)

J. L. Rowland, Chairman for the past three years of the National Conference on Interstate Milk Shipments, was reared in Texas and Missouri. He received his B. S. degree from Central College, Fayette, Missouri and his M. S. degree in Public Health from Loyola University, Chicago, Illinois. He has served as Chief Sanitarian for Oak Park, Illinois, Regional Milk and Food Consultant for the U. S. Public Health Service, Dallas, Texas, Sanitation Consultant, State of Florida and for the past four years as Director of the Bureau of Food and Drugs, Missouri Division of Health. He is a member of International Association of Milk and Food Sanitarians Inc., and a Fellow in the American Public Health Association.

Reprints of this article may be obtained at the office of International Ass'n. of Milk and Food Sanitarians at a nominal cost.

providing milk of acceptable quality for both armed forces and civilians, (2) allowing for greater utilization of good quality milk and milk products, (3) stimulate the production of a greater amount of high quality milk, (4) reduce the cost of securing milk supplies, and (5) reduce the amount of confusion both in the receiving and producing states.

BACKGROUND OF 1951 CONFERENCE

In 1946, the Conference of State and Territorial Health Officers requested the United States Public Health Service to develop a plan for the certification of interestate milk supplies. This plan is outlined in a letter dated December 31, 1946, from the Surgeon General to all state milk control authorities. In 1949, the Association of State and Territorial Health Officers again requested the Public Health Service to assist the states with the problem. Similar demands were made by state health departments and state agricultural departments, local health officials, and representatives of the milk industry. In December 1949, representatives of several midwestern states met in Indianapolis for the purpose of discussing the problem and of determining whether some plan could be set up to deal more effectively and efficiently with the interstate milk problem. As a result, representatives of eleven midwestern states met in Chicago, Illinois, in February, 1950. At this meeting, a committee was named to investigate the problem and to arrange for a national conference.

This committee requested the Surgeon General to invite all states to have their representatives attend a national conference at St. Louis, Missouri, June 1, 2, and 3, 1950. Representatives of industry, state health departments, and state agricultural departments of 26 states attended and participated in the meeting. As a result of group discussions and joint planning, certain basic conclusions and procedures were established to be used in developing and administering state milk control programs that would be in agreement with one another.

The report of the 1950 conference was used by many states in developing sound and more uniform programs of milk control. As such it was used as a guide for organization and administrative action, and its use developed a greater degree of reciprocal trust between the producing and receiving states. The plan was also used by many states to set up systems for the supervision and certification of intrastate milk sources, and has assisted many areas to secure better milk supplies for their people.

The 1951 conference was held to evaluate the interstate plan, to make constructive improvements, and to clarify certain aspects of the plan so that the program would more accurately meet the true interstate problem. From the progress reports of the producing and receiving states, it is evident that the plan has been placed in operation by several of the states and that the benefits of providing better milk supplies for many of our people are being enjoyed.

Public health benefits to our people and the welfare of the dairy industry, both in the producing and the receiving states, provide ample justification for the continuance of a National Conference on Interstate Milk Shipments.

RESUME OF SECOND NATIONAL CONFERENCE ON INTERSTATE MILK SHIPMENTS

The National Conference of representatives of the states meeting in behalf of the Interstate Milk Shipment Program convened at 8:30 A. M. in the Statler Hotel, St. Louis, on June 4, 1951.

At the conclusion of registration, Mr. J. L. Rowland, Chairman of the Conference, re-stated and re-emphasized the slogan and main objective of the conference —"The Best Possible Milk Supply for all the People"—and reiterated the oft repeated statement that it could only be attained by working together.

Visual aids were again very effectively used by Chairman Rowland, through the magician's magic, to remind the conferees of the human frailties and obstacles, the elimination of which could clear the way to our goal.

It was pointed out by the Chairman that twenty-one states had participated in the program during the past year; that a number of other states had taken steps to implement the program; and that still other states had indicated an interest in participating as soon as possible.

Dr. Buford G. Hamilton, Director of the Division of Health of Missouri, welcomed the Conference. He stressed that the success of our program could be assured by the willingness to accept and obey the so-called eleventh commandment, an admonition for the individual not to take his own importance too seriously.

Chairman Rowland requested Mr. H. L. Thomasson of Indiana to preside as chairman during the period when the progress reports and comments from representatives of the shipping states were presented to the Conference.

Mr. M. L. Raines from Texas State Health Department presided as chairman while the progress reports and other comments from representatives of the receiving states were presented to the Conference.

Mr. A. W. Fuchs, Chief of the Milk and Food Branch of the U. S. Public Health Service reported on the progress made by the Public Health Service in connection with tasks assigned to them by the 1950 National Conference.

Comments on the objectives of the Conference and of the extent, possibility and need of further progress were addressed to the Conference by the following representatives of other agencies:

Lt. Fred E. Stewart, U. S. Navy

Col. Russell McNellis, U. S. Army

Col. B. F. Leach, U. S. Air Force

C. J. Babcock, U. S. Department of Agriculture

E. B. Kellogg, Executive Secretary, Milk Industry Foundation

H. L. Wiltsee, Council of State Governments

Conferees moved for adjournment until the following morning.

On June 5, 1951, at 9:00 A. M. the conferees reconvened in General Assembly. Chairman Rowland assigned the delegates to the following task forces to study and make recommendations for the sol-

ution of the problem assigned to them.

1. Certification
2. Supervision
3. Laboratory.
4. Education.
5. Promotion of Interstate Program.
6. Manufactured milk products.
7. Channels and forms for reporting.

Chairman Rowland announced the following rules to govern the operation of

1. Task Force Rules

(a) Task forces will be appointed by the Chairman.

(b) Each task force will select its own chairman.

(c) Each task force will select a sub-committee of three to prepare the report of the task force.

(d) The chairman of the task force will present the report to the General Assembly at 4:00 P. M., Tuesday, June 5.

2. General Assembly Rules

(a) In general assembly, each state will be entitled to one vote. If there is more than one state agency represented they should caucus to decide whether to vote "yea", "nay" or "pass."

(b) Representatives of municipalities, industry, Public Health Service, and other federal agencies will not be entitled to a vote in the General Assembly.

The General Assembly adjourned until 4:00 P. M. to permit the task forces to convene and organize; receive and discuss the questions; and develop their recommendations for submission to the General Assembly.

The General Assembly reconvened at 4:15 P. M. and Chairman Rowland recognized Mr. E. B. Kellogg, Secretary of the Milk Industry Foundation, Washington, D. C., who presented the following statement of policy, agreed upon by the representatives of producers and processors of milk in attendance to the conferees in General Assembly:

1. We support the objective of this conference to do all possible to furnish the public with an adequate supply of dairy products of high quality as best serving the interests of producers, processors and consumers.

2. We believe that inspection requirements should be simplified as much as possible to include only those directly related to quality and safety.

3. We believe that the principle of certification of the quality of milk and cream supplies by a responsible authority will promote its acceptability to areas needing additional milk and cream.

4. The representatives of producers and processors here present are happy to make our contributions to the problems under consideration, and commend the originators of the Conference for their foresight and excellent leadership.

Chairman Rowland then requested Mr. C. K. Luchterhand of the Wisconsin State Board of Health to preside as chairman of the meeting while each task force chairman or his spokesman restated the questions, reported the names of the task force members, and submitted the recommendations of the group. A full report of the task force committees' recommendations are contained in the main report of the Conference.

The General Assembly then adjourned until 9:30 A. M., June 6, 1951, at which time it reconvened for consideration and final action on the task force recommendations.

The reports and recommendations of each group were again read, discussed and either accepted, amended, or rejected by the General Asembly. The final approved recomemndations are also contained in the main report of the conference.

Several of the task force committees recommended to the General Assembly the study of specific problems relating to the implementation of the interstate milk shipment program adopted by the Conference. These recommendations, as amended and approved by the General Assembly, were as follows:

1. The task force on Certification recommended that the Conference Chairman appoint a committee to prepare uniform shipping tags and bills of lading for use on interstate shipments of bulk milk and submit the information to the U. S. Public Health Service for circulation to and approval by the states.

2. The task force on Supervision recommended that a committee composed of industry and state representatives be appointed to study the feasibility of recognizing industry inspection under a broad plan of official supervision of such industry inspection.

3. The task force on Education recommended that a committee be appointed by the chairman to make a study of the educational procedures to be followed in furthering the aims of the National Conference on Interstate Milk Shipments and that this committee submit its report to the 1952 Conference.

4. The task force on Manufactured Milk Products recommended that a committee composed of representatives of state regulatory agencies, the Public Health Service, and the manufacturers of dairy products, be appointed to study and expedite the formulation of standards for Grade A supplemental milk fats, concentrated and dry milk products, and standards for the manufacture and processing of these products. Industry members of this committee should include representatives of the national associations of the products affected, including but not limited to, the American Dry Milk Institute, International Association of Ice Cream Manufacturers and the Milk Industry Foundation.

The following is a resolution that was submitted to and adopted by the General Assembly giving priority to the formulation of standards on concentrated milk:

"WHEREAS, it is the opinion of this Task Committee that the goal of the National Conference of Interstate Milk Shipments to provide 'The Best Possible Milk Supply for all the People' can be obtained more rapidly by shipment of Grade 'A' concentrated milk; it is suggested that the U. S. P. H. S. give priority to the formulation of the necessary standards, etc., for this product."

Selection of dates for the 1952 National Conference was referred to the Executive Committee. The General Asembly then adjourned the 1951 National Conference.

Summary of Policies Adopted by the First and Second National Conference on Interstate Milk Shipments* 1950 and 1951

REGULATION

Since there is no widely adopted standard available, other than the Milk Ordinance and Code recommended by the U. S. Public Health Service, the 1939 Edition shall be used as the basic standard. Compliance with this standard shall be measured by the U. S. Public Health Service milk sanitation rating method.

SUPERVISION

The receiving states should recognize inspection and supervision by the following:

1. Full-time local health department personnel.
2. Full-time local state agricultural department personnel.
3. Full-time local state health department personnel.

Supervision shall be based on the procedure outlined in the 1939 Edition of the U. S. Public Health Service Milk Ordinance and Code. It shall be measured by the enforcement rating procedures outlined in Reprint Number 1970 from the *Public Health Reports,* entitled "Methods of Making Sanitation Ratings of Milk Sheds."

The certifying agency in each shipping state shall be responsible for maintaining a record of volume control either directly or through designated agencies. A complete method of volume control should include monthly reports from each shipper on total quantity received and its subsequent utilization. These reports should be audited periodically.

CERTIFICATION

Receiving states should accept ratings made only by certified rating officials of either the U. S. Public Heatlh Service or the State Health Department. Certification shall include survey ratings on:

1. Producing farms.
2. Receiving stations or plants.
3. Enforcement rating of the supervising agency.

Area ratings shall be made not less than every two years. If an individual source is in a 90% rating area, an individual rating is not necessary, provided that individual ratings shall be furnished upon request of the receiving area. Milk plants or individual sources not under an area survey or which are in areas with less than 90% ratings shall have surveys made annually but not more often than semi-annually. If a request is received for a milk source not under recognized supervision, the survey will be denied.

The U. S. Public Health Service is to initiate a program to standardize the rating procedures of:

1. Its own personnel.
2. State rating officials.

There shall be published by the U. S. Public Health Service a list of state survey officers who have been standardized and whose rating methods have been spot-checked and approved by the U. S. Public Health Service.

All interstate shipments of milk shall be sealed at the time of loading with a single service seal in such a manner as to prevent unauthorized additions or withdrawals.

When an exported supply (raw or pasteurized) changes status because of degrading or permit revocation, the shipping state shall immediately notify the receiving state and the U. S. Public Health Service. The receiving state shall likewise notify the shipping state of any irregularities in the imported supply.

LABORATORY

The procedures outlined in the latest edition of *Standard Methods for the Examination of Dairy Products* of the American Public Health Association shall be strictly followed. Where alternative methods are permitted by the Standard Methods, milk intended for interstate shipment should be examined by either the standard plate count or the direct microscopic count. This examination shall include routine samples from each producer. Samples from each dairy farm shall be examined not less than the frequency prescribed in the 1939 Edition of the *Milk Ordinance and Code* recommended by the U. S. Public Health Service. The state may accept the results from local official laboratories which have been approved as complying substantially with American Public Health Association Standard Methods and checking closely with results obtained at least twice a year on split samples. The state may accept the results from officially designated laboratories which they have similarly officially checked periodically and found to be satisfactory. By "officially designated laboratories" is meant a private laboratory authorized to do official work by the supervising agency, or a milk industry laboratory similary officially designated for the examination of Grade A raw milk for pasteurization.

The requirements as to adherence to Standard Methods as to frequency of sampling, and state approval of local laboratories, and certification of laboratories by state agencies should apply to both raw and pasteurized milk and milk products.

The state approval of local laboratories should include an anuual visit to the laboratory, at which time evaluaion of the quarters, equipment, procedures, results, and records shall be made on appropriate survey forms of the U. S. Public Health Service, or the equivalent.

To insure uniformity, the U. S Public Health Service is to spot-check the laboratories of the state agencies participating in the certification of milk for interstate shipment, and to certify their compliance with standard methods.

It is recommended that the state certification agency notify the state laboratory agency as soon as possible of required laboratory surveys, and that the state laboratory agency send duplicate copies of its laboratory surveys, together with supporting data of the results of split samples, to the appropriate U. S. Public Health Service Regional Office. The Regional Office should then send one copy of the laboratory survey and data to the Milk and Food Laboratory of the Environmental Health Center. The Environmental Health Center will then spot-check and certify the compliance or lack of compliance, of the state laboratory agency to the appropriate U. S. Public Health Service Regional Office which, in turn, will transmit this information to the certifying agency.

CHANNELS AND FORMS FOR REPORTING

The State Health Officers of the shipping state shall report the results of every survey promptly to the Regional Office of the Public Health Service. That official shall report these results to the other Public Health Service Regional Offices concerned. An individual in the receiving states desiring information on a milk supply should make the request to the State Control Official in his own State who

*The 1950 report has been integrated with the 1951 Conference report.

will transmit the request to the Regional Office of the Public Health Service. Industry in a shipping state desiring a survey should likewise make the request to the Regulatory Official in his own state.

To expedite information concerning sources on which rating results are not available, requests and reports may be sent direct from one state agency to another state agency with carbon copies of requests and reports being sent to the Regional Office of the U. S. Public Health Service. To implement these procedures, the following are recommended:

1. The present interstate milk shipper survey report form shall be amended as shown on the attached copy. This report form should be printed in pad form on thin paper and be numbered. Wherever a part of this survey report form is left blank, the reason for such omission shall be indicated.

2. Permission shall be obtained from shippers for the release and publication of survey ratings through the use of an appropriate form. A suggested form is attached.

3. The U. S. Public Health Service is requested to publish the shipper compliance rating list semi-annually with supplements to be issued bi-monthly.

4. The Conference proposes to the U. S. Public Health Service that columns two and three in the listings of compliance ratings of shippers (May 10, 1951) be changed to show (a) volume of rated supply, and (b) Products.

ROLE OF THE PUBLIC HEALTH SERVICE

The state regulatory authorities should carry their work load involved in the interstate milk program with the assistance of the Public Health Service. The Public Health Service shall be prepared to extend to state regulatory authorities and educational institutions, such assistance in the training of field representatives of the state and local governmental units, or of industry, of plant and field personnel, and state survey officers as the respective states may require in operating the interstate milk shipment plan. The Public Health Service shall sponsor annual seminars of state survey personnel in each of

-12-

FEDERAL SECURITY AGENCY
PUBLIC HEALTH SERVICE
Washington, D. C.

INTERSTATE MILK SHIPPER REPORT

SHIPPER _____ ADDRESS _____ STATE _____

SURVEY AGENCY _____ DATE OF SURVEY _____

SURVEY OFFICER _____ DATE LAST CHECKED BY U.S.P.H.S. _____

AGENCY PROVIDING CONTINUOUS SUPERVISION OF SUPPLY _____

SURVEY REQUESTED BY _____ DATE _____

1. DAILY RECEIPTS (As of Date of Survey): Total volume of graded milk rec'd _____ gals.
Volume of supply represented by rating given in 5, below _____ gals.
Is milk other than graded milk received? Yes _____ No _____

2. PRODUCTS FROM RATED SUPPLY WHICH MAY BE AVAILABLE FOR SHIPMENT:

	Milk	Cream	Skim	Powder	Other (specify)
Raw					
Pasteurized					

3. INTERSTATE SHIPMENTS: (List on back name and address of out-of-state plants supplied in past six months. Name product and if from rated or non-rated supply.)

4. TYPE OF SURVEY: (Check One) Individual shipper _____ Area _____

5. RATING: ✓

	Producers	Receiving Stations	Past. Plants	Past. Milk	Enforcement
Total No.				XXXXX	XXXXXX
Total Surveyed				XXXXX	XXXXXX
Rating %					

6. ITEMS OF SANITATION OF LESS THAN 75% COMPLIANCE:
Raw to Plant Milk _____
Receiving Stations _____
Pasteurization Plants _____

7. LABORATORY CONTROL:
Name and address of approved laboratory _____
Date last checked by the official agency _____

8. PUBLICATION OF RATING: (Written permission of shipper necessary for publication.)
Written permission received from shipper. Yes _____ No _____ Date _____

DATE OF REPORT _____ SUBMITTED BY _____
(Signature and Title)

_____
(Agency)

ADDITIONAL INFORMATION ON THIS SHIPPER MAY BE OBTAINED FROM SURVEY AGENCY

-13-

(REVERSE SIDE OF PAGE 12)

REPORTED SHIPMENTS

PLANT	CITY AND STATE	PRODUCT	VOLUME

SUGGESTED FORM FOR OBTAINING PERMISSION FOR PUBLICATION OF RATINGS:

To: ____(SHIPPER)_____

____(ADDRESS)_____

You are hereby advised that the recently requested survey has been completed with the following rating results:

Milk Supply_____ Plant Facilities _____

These results will be published and furnished to state and territorial milk control officials and to prospective purchasers only with your permission.

Please sign the consent at the bottom of one of the copies of this letter, and return it to this office.

Very truly yours,

_____

Permission is hereby granted to release and publish the above stated ratings for use by state and territorial milk control authorities and prospective purchasers.

_____
NAME OF PLANT

_____
OFFICER

_____
TITLE

DATE:_____

its regions for the coordination of survey rating procedures and interpretations. The Public Health Service should also train or assist in training laboratory personnel of state or local laboratories or of industry as requested by state authorities.

The Public Health Service should spot check the inspection and survey work of enforcement agencies to determine whether milk regulations are being correctly interpreted and enforced.

The Public Health Service should furnish state regulatory agencies periodically with interpretations of regulations based on quesions submitted by such agencies and also that state authorities relay such interpretations to local enforcement agencies and/or industry.

It should be recognized that assistance from the Public Health Service can only be effective insofar as state regulatory authorities cooperate. Information can only be disseminated after it has been correctly and promptly submitted by the states. Upon request, interpretations of regulations will be supplied. Therefore, the Public Health Service should urge all state authorities to continuously furnish it with information so that all states may be kept informed. The general purpose of the foregoing statements is to promote uniformity in interpretation and enforcement of standards for interstate milk shipments. The prime role of the Public Health Service is to bring about the highest degree of uniformity in attitude and performance on the part of state authorities so that any certification of milk supply can be accepted with confidence.

NEW POLICIES AND RECOMMENDATIONS ESTABLISHED AT THE 1951 CONFERENCE

MANUFACTURED MILK PRODUCTS

The program should be expanded to include all milk constituents used in the preparation of "milk products" as may be defined under Section 1, paragraph K, 1939 Edition of the U. S. Public Health Service *Milk Ordinance and Code,* and also to include all milk constituents used in frozen desserts.

In addition, the following action on specific products is recommended:

1. *Concentrated Milk*

Adequate standards shall be formulated for the concentrating operations and the finished products. These shall include the pasteurization and the packaging as a finished Grade A product.

2. *Dry Milk Solids*

Adequate standards shall be formulated for the drying operations and the finished product.

3. Adequate standards shall be formulated for supplemental milk fats to be used in milk products and frozen desserts.

The industry and regulating agencies are in need of standards for Grade A supplemental milk fats, concentrated and dry milk products, and for the manufacturing and processing thereof. It is recommended that the Public Health Service, together with representation from this Conference, to which would be invited representatives of the national associations of the products affected, including, but not limited to, the American Dry Milk Institute. International Association of Ice Cream Manufacturers, and the Milk Industry Foundation, consider the recommendations contained in this report, and take all means necessary to expedite the formulation of such standards as are necessary.

EDUCATION

The following resolution on education was adopted by the Conference:

1. There is a definite need for developing comprehensive educational programs to include milk producer groups. owners, operators and employees of milk plants, representatives of regulatory agencies, and state and local governing bodies.

2. These programs should have as their purpose assistance in the establishment of compliance with regulations approved by this conference, and the creation and maintenance of public confidence in milk and milk products. Public confidence in dairy products is essential to the welfare of industry and consumer alike.

3. This educational approach should also be directed towards developing a more cooperative endeavor and understanding of mutual problems between milk producers, distributors, and regulatory officials. These programs should also develop the belief in the minds of milk producers, milk plant employees and similar groups that sanitation is essential to the individual as well as to the milk industry.

4. Through this educational approach it will be possible to expedite and coordinate the activities of the regulatory officials and industry with the requirements and necessities for expanded milk production and processing programs for the armed forces.

5. Inasmuch as considerable planning is essential in the preparation and application of these educational programs, the life of this Committee shall be extended by the Chairman of the Conference until the 1952 Conference to permit proper development of these various programs.

6. It is further recommended that the activities of this educational committee be extended to include vocational training and agricultural schools, Future Farmers of America, 4-H Clubs and similar groups.

7. It is necessary to maintain the value of quality milk as a food product in these consumer groups by creating and maintaining a better understanding and appreciation of the extremely important part played by both the dairy industry and regulatory officials in our American way of life.

PROMOTION OF INTERSTATE PROGRAM

The Conference and conferees should make every effort to extend to all states the program for cooperation in the regulation of interstate shipments of milk.

It is recommended that the following methods be used in reaching this objective:

1. Through educational programs with consumers, producers, industry and control officials.

2. Through the use of demonstration areas which have been successful in improving quality and resulting in more economical administration, in addition to rendering valuable service to both the shipping and receiving state.

3. Through the personal efforts of the members of this conference, particularly in those neighboring states which are not now participating.

4. Where legislation or other action is needed, encouragement and support should be solicited from agencies and groups such as the Council of State Governments.

THE MINUTES OF THE EXECUTIVE COMMITTEE OF THE NATIONAL CONFERENCE ON INTERSTATE MILK SHIPMENTS

June 7, 1951

The forum of the Executive Committee convened at 8:30 a. m., June 7, 1951, Hotel Statler, St. Louis, Missouri.

The Executive Committee was divided into groups and charged with the responsibility of preparing the various sections of the report. Further, they were instructed to return their section of the report to the chairman not later than July 1, 1951. The Conference chairman was authorized to compile the various sections into the final draft of the 1951 Conference report.

The Executive Committee elected J. L. Rowland to serve as chairman of the National Conference on Interstate Milk Shipments for the year June, 1951 to June, 1952.

A motion was made and adopted granting the chairman authorization to appoint an executive committee for the same year as indicated above. The Executive Committee suggested that a rotation plan be published concerning its membership.

The Executive Committee instructed the chairman to appoint the committee for the new year with consideration being given to proper balance and representation from shipping areas and receiving areas as well as geographical locations, agricultural and health agencies, industry groups, both producers and processers, and any other groups related to the problem.

The Executive Committee moved and carried a motion authorizing the Chairman to appoint a sufficient number of committees to deal with the various problems relating to the conference and the program.

Arrangements were made with the Hotel Statler for the 1952 National Conference to be held in St. Louis, June 10, 11 and 12, 1952.

EXECUTIVE COMMITTEE

National Conference on Interstate Milk Shipment

The Honorable Clinton P. Anderson,
United States Senate,
Washington, D. C.

Mr. Frank Bane,
Executive Secretary,
Council of State Governments,
1313 East 60th Street,
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Mr. William Crighton,
Producers Creamery Company,
Springfield, Missouri

Mr. Alfred H. Fletcher, Director
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New Jersey State Health Department,
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International Association of Ice Cream Manufacturers,
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Mr. E. Kellog,
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Texas State Deparment of Health,
Austin, Texas.

Mr. C. K. Luchterhand,
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Dr. Harold Macey,
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St. Paul Campus,
St. Paul, Minnesota.

Mr. L. J. Peterson,
Administrative Director,
Idaho Department of Public Health,
Boise, Idaho.

Mr. P. E. Riley,
Milk Sanitarian,
Ilinois Department of Public Health,
Chicago, Illinois.

Honorable Leonard A. Scheele,
Surgeon General,
U S. Public Health Service,
Washington, D. C.

(Mr. John Faulkner—his representative).
Mr. C. W. Van Schoik,
Chief, Food and Drug Division,
Ohio Department of Agriculture,
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Mr. Alex G. Shaw,
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Mr. H. L. Thomasson,
Ex. Sec. I. A. M. F. S.
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Box 286,
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Mr. H. J. Weavers,
Chief, Dairy and Foods,
State Department of Agriculture,
Madison, Wisconsin.

REPORT OF THE COMMITTEE ON THE PROFESSIONAL STATUS OF SANITARIANS

At last year's meeting the committee on Professional Status submitted for your consideration a statement on qualifications for milk and food sanitarians. This was done because it was believed that there should be a clear understanding of the term "Milk and Food Sanitarian" prior to the initiation of any program of professional development. In this statement the milk and food sanitarian was presented as a member of the sanitarian category with special competencies in milk and food sanitation. Pending aceptance of this statement, there was little further that could be done.

In response to a request from your President, Dr. K. G. Weckel, an investigation was made of current developments that relate to the acceptance of the sanitarian for professional work. The information was obtained by circularizing the states with a brief questionaire. Replies were received from forty-seven states and four territories.

The first question related to registration acts in force or in process. Three states indicated that such acts had been enacted by their legislatures. One other state has a more general license law that includes non-engineering sanitation personnel. An additional two states have had bills on registration of sanitarians submitted to but not enacted by their legislatures. The intent of these measures is to restrict the use of the term "sanitarian" to those individuals who fulfill the requirements of the act and to restrain to some degree local governments from employing non-registered sanitarians.

The next question considered was the consistency with which states used the term "sanitarian" in their official job description sheets. It was found that forty states have one or more jobs listed under the term "sanitarian". Seven states and four territories do not use the term.

The next point considered was what does the term "sanitarian" mean when used in the state job description sheet. In assembling this information, no attempt was made to relate the training requirement to the job level. These data are presented here under two categories:
(1) training requirements for sanitarians, and (2) training requirements in states using other titles.

Job title	Number	4 Years College	4 Years or equivalent	Less than 4 Years
Sanitarian	40	21 (52%)	21 (52%)	7 (17.5%)
Other	11	2 (18%)	5 (45%)	6 (55%)

It is interesting to note that of the seven states having jobs requiring no stated training, five required such training at some job levels.

The next point investigated was the provision for promotional progress for the sanitarian. Here, the writer admits to failure to provide in the questionaire a distinction between promotional progress and salary advancement. Consequently the data received does not admit to accurate interpretation. However, only four states reported no provision for advancement.

The last question was concerned with the coverage given by state job specifications. This was deemed to be in need of investigation since the number of jobs in the state agency is usually small in comparison to the number of local agencies. Twenty-eight states reported that the state requirement applied to some portion of their local health departments. A common pattern was application to all local agencies except the larger cities having a merit system of their own.

In brief the current situation with respect to the sanitarian appears to be more affected by merit systems than by registration acts although the increasing interest in this type of legislation is an item of considerable interest. There also seems to be an increasing trend to associate formal training with the term "sanitarian". This leaves two important questions to be answered:

(1) Are the current influences on the status of the sanitarian sufficient to bring about his eventual emergence as an accepted professional?

(2) Should this association include in its activities a professional development program?

In answer to the first, it is pointed out that other professional groups have not been content to repose their welfare totally with merit system development but have developed for themselves means of attaining professional status. The second question is believed to be beyond the province of this Committee. Accordingly, a motion will now be offered terminating the Committee on Professional Status and creating a Committee on the Professional Development of Milk and Food Sanitarians.

HAROLD B. ROBINSON, *Chairman*
Committee on Professional
Status of Sanitarians
International Association of
Milk and Food Sanitarians, Inc.

• Presented at the Thirty-eighth Annual Meeting, International Association of Milk and Food Sanitarians, Inc., Glenwood Springs, Colorado, September 26-29, 1951.

DAIRY TECHNOLOGY CONFERENCES 1952

The following Dairy Technology Conferences in 1952 will be held at the University of Illinois:

STARTERS AND FERMENTED MILK DRINKS — March 4-5
The causes of inactive starters, poor flavor, and lack of uniformity in results will be discussed. Methods for the manufacture of the different types of cultured milk drinks will be explained.

PLANT SANITATION — April 1-2
Sanitary control in dairy plants will be the general theme of this conference. Leading men in the field of public health will be guest speakers.

HIGH TEMPERATURE SHORT-TIME PASTEURIZATION — May 6-7
There is a general interest of the dairy industry in high temperature short-time pasteurization not only for market milk but other dairy products as well. Special consideration will be given to the operation and sanitizing of the equipment. Studies pertaining to time and temperature relationships to pasteurization efficiency will be explained.

INFORMATION:
Programs — Detailed programs for each conference will be available at a later date.
For Further Information—Write to
Mr. R. K. Newton,
Supervisor of Conferences
Division of University Extension
713½ South Wright Street
Champaign, Illinois.

A SINGLE REAGENT FIELD TEST FOR QUATERNARY AMMONIUM SOLUTIONS

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A test method is described for the verification of proper use concentrations of solutions of straight quaternary ammonium rinses or formulated detergent-quaternary preparations. The simple test kit and direct procedure afford an economical and easily used test method for the sanitarian and the food and beverage worker. The estimation of the quaternary concentration is accomplished by the reaction of the quaternary with a definite amount of bromphenol blue accurately buffered on the acid side. The blue color of the dye-quaternary complex is dominant if 200 ppm. or more of quaternray is present in the solution. If less than 200 ppm. quaternary is present various shades of green are produced by the partial conversion of the dye to its blue complex plus the acidified yellow excess. The test reagent may be used with many proprietary preparations after the dye demand of the specific quaternary at the recommended use concentration is established.

The test described is simpler than related methods in eliminating use of an organic solvent and in its wide adaptability to service conditions. It is simple and accurate and economical enough to encourage greater use of controlled solutions.

INTRODUCTION

Numerous procedures for the assay of quaternary ammonium sanitizing solutions have been developed in the past few years for use in the laboratory or in the field. Methods showing a wide range of complication in use and accuracy of results are available but none have combined the elements of accuracy, economy, speed, and simplicity to a degree leading to a desirable widespread acceptance and application by sanitarians and other users of quaternary ammonium compounds.

The reaction occurring between certain quaternary ammonium compounds and tetrabromphenolsulfonphthalein (bromphenol blue) leading to an intensely blue reaction product has been widely used in principle by workers in the past ([1, 2, 3, 4]). The unique feature of the present method is that no volatile organic solvent is required since the dye-quaternary salt is used directly as formed in the aqueous phase.

The prime objective of this work was to develop a single test reagent suitable for use in the field merely to differentiate minimum use concentrations of certain quaternary ammonium type sanitizing agents from marginal or improperly dilute solutions. Such a reagent was to be furnished in a simple kit for use in evaluating either a straight quaternary rinse or a formulated, alkaline detergent-sanitizer. Since it was intended that the kit be suitable for use by both control enforcement agents and by the non-skilled food and dairy worker as well, simplicity of use was an important requirement. The composition range of water supplies and the variation in pH and titratable alkalinity of the solutions to be tested were additional considerations. Further, it was desired that the same reagent volume addition be used in all tests for any particular quaternary.

MATERIALS AND METHOD

In addition to bromphenol blue, the reagent contains buffering chemicals to bring the final solution to a pH very close to 3, regardless of water supply or initial alkalinity of the solution. Sodium acetate and acetic acid at a ratio of 1 to 5 were found to be suitable.

The composition of the reagent is as follows:

	Percent by weight
Bromphenol blue	0.08
Sodium acetate C. P. ($NaC^2H^3O^2$-$3H^2O$)	12.50
Glacial acetic acid	62.50
Distilled water	24.92

The solution is quite easily prepared by dissolving the bromphenol blue in the acid and water mixture and then adding the acetate salt. In preparing large volumes, the solution of the dye may be hastened by first dissolving it in a minimal amount of 95 percent ethanol.

A photograph of a complete and practical testing kit is shown in the illustration.

For two typical products, Spartec* and Tri-Bac,* the test is conducted by adding 0.40 ml of the reagent to 6.0 ml of the quaternary solution in a small specimen vial graduated at the 6.0 ml level. The volume of reagent may be added from a dropping pipette standardized to deliver the required volume in a definite number of drops. Then, simply by counting the number of drops, the operator can easily add the proper amount of reagent. Upon mild agitation of the vial a clear blue color appears if the quaternary content of the solution under test is of a magnitude of 200 ppm or more. This is a commonly recommended sanitizing strength. A blue-green, green or yellowish color indicates less than 200 ppm, 100 ppm or less, and 50 ppm or less, respectively.

Mr. Dwight B. Conklin has been a staff member of the Bacteriological Section of the Research and Development Division of Wyandotte Chemicals Corporation since 1945. He received a Master of Arts degree from Syracuse University where he also served as an instructor in bacteriology. Before going into industry he spent two years as a research assistant in plant biology at the State University of Iowa.

* Trade marks registered by Wyandotte Chemicals Corporation. Spartec is a sanitizing agent based on methyldodecylbenzyltrimethyl ammonium chloride and Tri-Bac is a mildly alkaline detergent-sanitizer containing di-isobutylphenoxyethoxyethyldimethylbenzyl ammonium chloride.

DISCUSSION

The quantitative color effect results from the high affinity of bromphenol blue for quaternary ammonium compounds and their relative concentrations in the final solution. The complex formed is essentially deep blue in color in the amounts in which it is present in these tests. It is formed from the dye as long as there is quaternary and dye available in the solution. Assuming that 200 ppm quaternary is the desired dilution for most purposes, then the concentration of the bromphenol blue in the final solution is adjusted to yield a definite blue color at this level. Four tenths ml of the reagent furnishes this amount of dye plus sufficient buffer to give the solution a pH of about 3. The lower quaternary concentrations are detected when the formation of the blue complex is limited in amount by the quaternary and the excess bromphenol blue retains the yellow color of its acidified solution. When the mixture is viewed by transmitted light the two colors blend into various greens indicative of the concentration of the quaternary.

The need for careful control of pH in such a system is obvious since bromphenol blue is itself an indicator dye showing color transformation in the pH range 3.0–4.6. Unless the solution is heavily buffered at the proper pH as described, minor differences in dissolved salts may interfere with the color. With the use of the acetic acid-sodium acetate system, successful tests are obtained in synthetic hard waters containing up to 30 grains per gallon total hardness. This buffer system also allows the application of the test to moderately alkaline quaternary formulations now widely used where washing and sanitizing are to be accomplished in one operation. Interference of many contaminating agents such as beer, milk, synthetic detergents and even soaps is similarly overcome up to a point where the concentration of such materials begins to inhibit the sanitizing action of the quaternary.

The bromphenol blue-quaternary complex suspended in water exhibits a certain amount of wine red fluorescence when the vial is held in such a way that the solution is seen in reflected light. If the test is viewed in transmitted white light, that is, with the vial between the light source and the eye of the observer, the true colors are seen. The reflected light emission must be ignored, or the vial may be placed in a viewing block that would allow only transmitted light to be used. Some fading of the test colors occurs if the vial is allowed to stand very long after completion of a test but since the test can be interpreted immediately this has no significance.

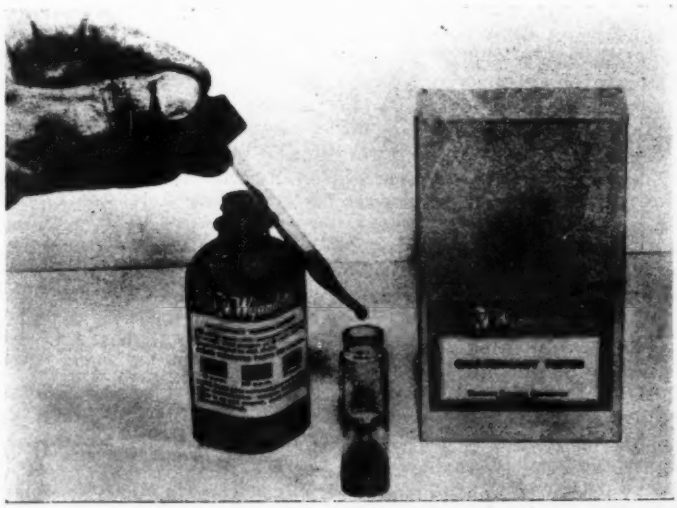
The test reagent has proven to be quite stable in storage at ordinary conditions. Accelerated storage tests have shown that the solution retains its original characteristics for a period equivalent to at least six months at room temperature when kept in tightly capped bottles.

The method has been found to work satisfactorily with many quaternary preparations. However the dye requirement may vary from one quaternary to another and in each case the volume of reagent necessary to produce differentiating colors should be determined from known dilutions.

A great advantage of the described test is its low cost. The reagent and accompanying kit can be prepared and distributed economically enough to allow its frequent use by all interested in determining the strength of quaternary ammonium sanitizing solutions. Increased vigil resulting from the use of this practical test should assist in the movement toward better utensil sanitation in the food and beverage industries.

CONCLUSIONS

A simple method has been devised for the colorimetric differentiation of the 200 ppm range quaternary ammonium sanitizing solutions from those of lesser strengths. The addition of a measured volume of a single reagent to an aliquot of the quaternary use-solution allows the operator to determine immediately if the solution has the proper sanitizing strength. Simplicity, low cost and adaptability to a variety of quaternary products and water conditions promises wide acceptance of this method.



REFERENCES

1. Hartley, G. S. and Runnicles, D. F., *Proc. Roy. Soc. of London*, Series A, **934**, 168, 424 (1938).
2. Auerbach, M. E., *Ind. Eng. Chem. Anal. Ed.*, **15**, 492–493 (1943).
3. Brooks, R. F. and Hucker, G. J., *J. Milk and Food Technol.*, **11**, 136–138 (1948).
4. Cucci, M. W., *Soap and Sanitary Chemicals*, **24**, (8), 129 (1948).

MILK and FOOD SANITATION

SANITIZATION OF DAIRY FARM UTENSILS. A COMPARISON OF A CLEANER-SANITIZER CONTAINING HYAMINE 1622 WITH AN ALKALINE CLEANER AND HYPOCLORITE SANITIZER

W. E. Botwright

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On the basis of total and thermoduric plate counts of milk, sixty producers were divided into two groups of equal sanitary level. One group was supplied a standard cleaner and hypochlorite sanitizer. The other was given a detergent-sanitizer containing Hyamine 1622 and Triton X-100. The detergent-sanitizer group showed greater quality improvement, especially on lower grade farms. Appearance of utensils, farmer's comments, and laboratory studies indicate that these results were due to the superior detersive and germicidal properties of the detergent-sanitizer.

Introduction

The problem of thermoduric organisms in milk has received increased attention during the past few years because of the use of the new standard agar which is more conducive to the growth of these bacteria and thus to their detection, and to the increasing use of high-temperature short-time pasteurizing units which allow the survival of greater numbers of the thermoduric micrococci. It is generally agreed that unclean dairy farm equipment is the principal habitat of thermodurics and that proper cleansing and sanitizing of equipment is necessary for the production of high quality milk.

A number of workers have demonstrated the susceptibility of thermodurics to quaternary ammonium germicides. Jensen and co-workers found that 0.5 percent lye and 200 ppm quaternary solutions had comparable germicidal activity.[6, 7] Quaternaries were more effective against thermodurics. Mallmann obtained poor results with a detergent-sanitizer, using a different procedure and composition than herein described.[8]

Hucker studied the detersive and germicidal efficiencies of cleaner-sanitizer compositions containing quaternaries, non-ionic wetting agents, and other detergents.[5] Such combinations were found to be particularly effective against thermoduric organisms. Use of cleaner-sanitizers on a number of farms maintained milking machines in a sanitary condition with consequent production of high quality milk.

No conclusions or recommendations were developed from a large scale study reported by Meany.[9] Barber has presented data showing the performance of several detergent-sanitizers.[2] Proper formulation was found to be a most important factor.

Laboratory and Preliminary Farm Trials

A laboratory test procedure for determining the combined effect of germicidal and detergent activity has been developed by Goetchius and Botwright.[4] This method, which simulates farm conditions, was used to evaluate a number of liquid and powdered preparations containing a quaternary ammonium compound (Hyamine * 1622), and a non-ionic wetting agent (Triton ** X-100). Due to solubility limitations it was not possible to incorporate more than 30 percent active material in the liquids. Consequently, these preparations were less effective detergents. The most effective liquid containing 10 percent sodium metasilicate pentahydrate, and 70 percent water performed well in laboratory tests and on dairy farms, but was inferior to most powdered cleaner-sanitizers. These findings generally agree with those of Dahlberg and co-workers who found that neutral liquid preparations were inferior to alkaline powdered preparations.[3]

During a preliminary farm trial three powdered detergent-sanitizers were compared with a standard cleaner and hypochlorite sanitizer which were used according to the customary procedure. The equipment on the detergent-sanitizer schedule was rinsed in lukewarm water immediately following morning milking. The milking machine was disassembled, brushed in the detergent-sanitizer solution, and allowed to dry without rinsing. Immediately prior to milking, all equipment was rinsed with hot water. At night milking, a flush wash was substituted for disassembling and brushing.

Prior to each milking a sterile buffer solution containing both chlorine and quaternary inactivators was drawn through each machine. Total and thermoduric counts of the rinse solutions showed one composition to be particularly outstanding.

Hyamine 1622 crystals	10%
Triton X-100	5%
Sodium metasilicate pentahydrate	30%
Tetrasodium pyrophosphate	55%

This is a white, free-flowing powder which has a pH of 10.5 at the 0.2 percent use solution concentration. This has been proven to be non-irritating to the udder and teats of the cow, and to the hands of the operators engaged in its use.

It may be noted that Hucker and others have reported that sodium metasilicate is generally incompatible with quaternaries. However, we have found that certain proportions of this salt enhance the germicidal activity of Hyamine 1622, and thus advantage may be taken of its excellent detergent properties.

* Di-isobutyl phenoxy ethoxy ethyl dimethyl benzyl ammonium chloride, monohydrate.

** Alkyl aryl polyether alcohol. Trade-Marks of Rohm & Haas Company.

Received B.S. degree in biochemistry from Michigan State College in 1938. One year of graduate training was mainly devoted to food technology and a study of chlorine germicides. Engaged for the past twelve years in the research, development, and application of germicides in medical, industrial, and food sanitation fields.

FIELD TRIAL

A field trial was then conducted in cooperation with a large dairy company on farms shipping milk to two country receiving stations. At each of these two receiving stations 35 farms were selected which had a record of insanitary milk production, based on plate counts of laboratory pasteurized samples.

CONTROL PERIOD

Ten to twelve samples of each of 70 producers' milk were collected at the receiving station during a 15-day period. On arrival at the laboratory, a slide was made for direct microscopic examination and a plate count made of the raw milk and after laboratory pasteurization at 143° F for 30 minutes.[1] Thirty farms at each station were selected from those producing the poorest milk and divided into two groups of 15. The remaining farms were dropped from the experiment. An extra producer whose bacteria counts were extraordinarily high was included in the group receiving cleaner-sanitizer at one station in order to provide a more severe test for the new materials.

EXPERIMENTAL

Each farm was then visited. The purpose of the experiment was explained and the farmers' cooperation solicited. Facilities for milk production were noted and the milking machine, utensils, and cans examined. The long vacuum hoses were cleaned by soaking in detergent solution and brushing, as some workers have shown them to be a source of contamination. Supplies of the appropriate cleaning materials were provided and their use carefully explained.

Group I farms were asked to sanitize their equipment by prerinsing, brushing in detergent solution, rinsing, and storing dry. The machine and utensils were rinsed with hypochlorite solution prior to milking. Group II farms were requested to use cleaner-sanitizer #5 according to the procedure given on page 2.

For a period of 13 weeks, samples were collected twice weekly and bacteriologically analyzed as during the control period. During the third and fourth weeks of this experimental period, all farms were again visited to check on methods of use. Further calls were made only on those producers having high pasteurized counts. As this occurred more frequently in Group I (using cleaner and hypochlorite), these producers received more stimulus to clean utensils.

RESULTS

Tables 1 and 2 present the plate counts of raw and laboratory pasteurized milk samples averaged logarithmically and arithmetically for each group at each station during the control and experimental periods.

At station A both groups improved milk quality during the experimental period. At station B Group I produced milk of similar quality during the entire experiment. At both stations, farmers using cleaner-sanitizer #5 produced excellent milk. Pasteurized counts were much lower with those exceeding 5,000 being reduced to a minimum.

Pseudomonas type organisms were observed rather frequently during the trials of Dahlberg.[3] These organisms were not controlled by quaternary sanitizers or a near-neutral liquid cleaner-sanitizer. An alkaline cleaner-sanitizer (pH 10.5) containing Hyamine 1622 and Triton X-100 was superior in this respect. During the present study

TABLE 1

STATION "A" SUMMARY

	Group I		Group II	
	Total	Thermoduric	Total	Thermoduric
Average Counts — 15 Day Control Period				
Arithmetic	72,400	3,820	128,000	6,310
Logarithmic	21,500	815	35,900	1,020
Percent Over 5,000		17.2%		20.0%
Total No. Samples	161	157	171	165

Average Counts — 13 Weeks' Experimental Period	(Cleaner+Hypochlorite)		(Cleaner—Sanitizer #5)	
	Total	Thermoduric	Total	Thermoduric
Arithmetic	75,700	2,830	67,700	768
Logarithmic	20,600	661	17,900	221
Percent Over 5,000		11.1%		2.39%
Total No. Samples	387	398	411	419

The percentage of pasteurized counts exceeding 5,000 are included as an index to the proportion of the samples which would be classified as "poor" milk.

TABLE 2

STATION "B" SUMMARY

	Group I		Group II	
	Total	Thermoduric	Total	Thermoduric
Average Counts — 15 Day Control Period				
Arithmetic	265,000	3,490	120,000	4,130
Logarithmic	61,000	1,250	43,000	1,240
Percent Over 5,000		13.7%		18.4%
Total No. Samples	149	146	149	147

Average Counts — 13 Weeks' Experimental Period	(Cleaner+Hypochlorite)		(Cleaner—Sanitizer #5)	
	Total	Thermoduric	Total	Thermoduric
Arithmetic	115,000	7,000	65,700	714
Logarithmic	33,600	1,040	14,100	234
Percent Over 5,000		24.4%		1.61%
Total No. Samples	368	365	373	372

TABLE 3

PERCENT DISTRIBUTION OF THERMODURIC COUNTS BY RANGE

Station A

Range	Group I (Cleaner+Hypochlorite)		Group II (Cleaner—Sanitizer #5)	
	Control period	Experimental period	Control period	Experimental period
0–100	9.6	11.16	11.50	29.52
101–10,000	74.7	81.40	71.10	69.70
Above 10,000	16.3	7.5	16.40	0.70

Station B

Range	Group I (Cleaner+Hypochlorite)		Group II (Cleaner—Sanitizer #5)	
	Control period	Experimental period	Control period	Experimental period
0–100	4.1	12.9	4.8	26.9
101–10,000	89.2	72.6	83.4	70.3
Above 10,000	6.7	17.2	19.8	0.5

Pseudomonads were seen on only two plates. By the "rubber strip" evaluation technique cleaner-sanitizer #5 is the most effective experimental or commercial preparation tested to date by this laboratory against dairy strains of Pseudomonas.

Distribution of pasteurized counts is given in Table 3. These data demonstrate that the reduction in the average pasteurized counts of patrons using cleaner-sanitizer #5 has been due to the virtual elimination of counts exceeding 10,000. This is highly important because the quality of an entire supply can be significantly lowered by one poor producer.

INDIVIDUAL PRODUCERS

Tables 4 and 5 present the logarithmically averaged pasteurized counts of each patron during the control and experimental periods.

These data show that pasteurized counts of 84 percent of the producers using cleaner-sanitizer #5 decreased compared to 53 percent of those using the commercial cleaner and the hypochlorite sanitizer. This, togeter with data in Table 3 which show that pasteurized counts over 10,000 were virtually eliminated, demonstrates that the use of the cleaner-sanitizer #5 has the greatest effect on the lower grade producer, thus resulting in a milk supply of higher bacterial quality.

The logarithmically averaged plate counts for each group of producers are graphically presented in Figs. 1 and 2. There appears to be little relationship between the counts of raw and laboratory pasteurized samples. At each station, the pasteurized counts of the producers using cleaner and hypochlorite (Group I) show an upward trend which is marked by rather large daily variation. On the other hand, Group II (cleaner-sanitizer #5) pasteurized counts trend downward with lesser daily variation. Considering the pasteurized counts as an index of the sanitary condition of the milking machine and utensils, it may be concluded that the cleaner and hypochlorite, as used by the producers, are less effective than cleaner-sanitizer #5. It would appear that the combination material minimized human fallibility providing a method

TABLE 4

LOGARITHMICALLY AVERAGED THERMODURIC COUNTS OF INDIVIDUAL PRODUCER'S MILK STATION "A"

Group I (Cleaner+Hypochlorite)			Group II (Cleaner—Sanitizer #5)		
Producer No.	Control period	Experimental period	Producer No.	Control period	Experimental period
2	13,000	3,160	5	8,000	94
25	440	439	7	940	746
57	8,000	656	9	730	713
61	620	440	15	1,400	658
62	1,100	2,740	19	1,300	133
117	370	665	24	380	132
122	2,800	4,010	42	26,000	535
125	4,100	556	46	220	109
133	470	318	51	230	311
138	1,400	357	56	180	127
162	240	432	63	210	101
168	140	106	106	4,300	197
181	280	1,020	137	19,000	86
199	270	406	142	550	927
200	200	516	157	1,600	233
			192	220	157

TABLE 5

LOGARITHMICALLY AVERAGED THERMODURIC COUNTS OF INDIVIDUAL PRODUCER'S MILK STATION "B"

Group I (Cleaner+Hypochlorite)			Group II (Cleaner—Sanitizer #5)		
Producer No.	Control period	Experimental period	Producer No.	Control period	Experimental period
6	1,700	2,860	2	5,300	109
13	1,400	550	16	6,800	81
22	4,500	3,030	17	230	150
34	620	605	28	1,100	175
40	220	231	29	3,500	70
62	300	171	41	360	957
66	980	479	48	4,200	611
83	2,700	1,010	52	1,200	530
89	5,300	776	56	2,300	340
92	4,900	1,460	68	190	392
96	3,200	8,000	97	1,250	234
99	2,100	3,500	107	5,400	478
106	1,000	2,690	117	400	238
108	370	2,500	121	470	253
112	360	138	122	250	90

FIGURE 2

STATION B

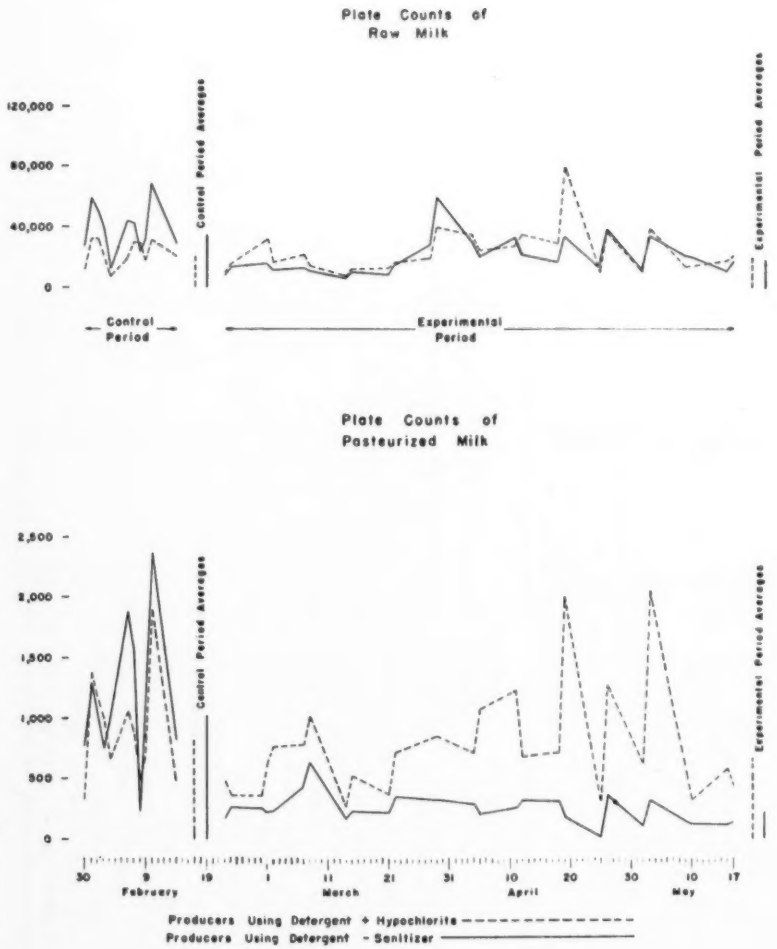
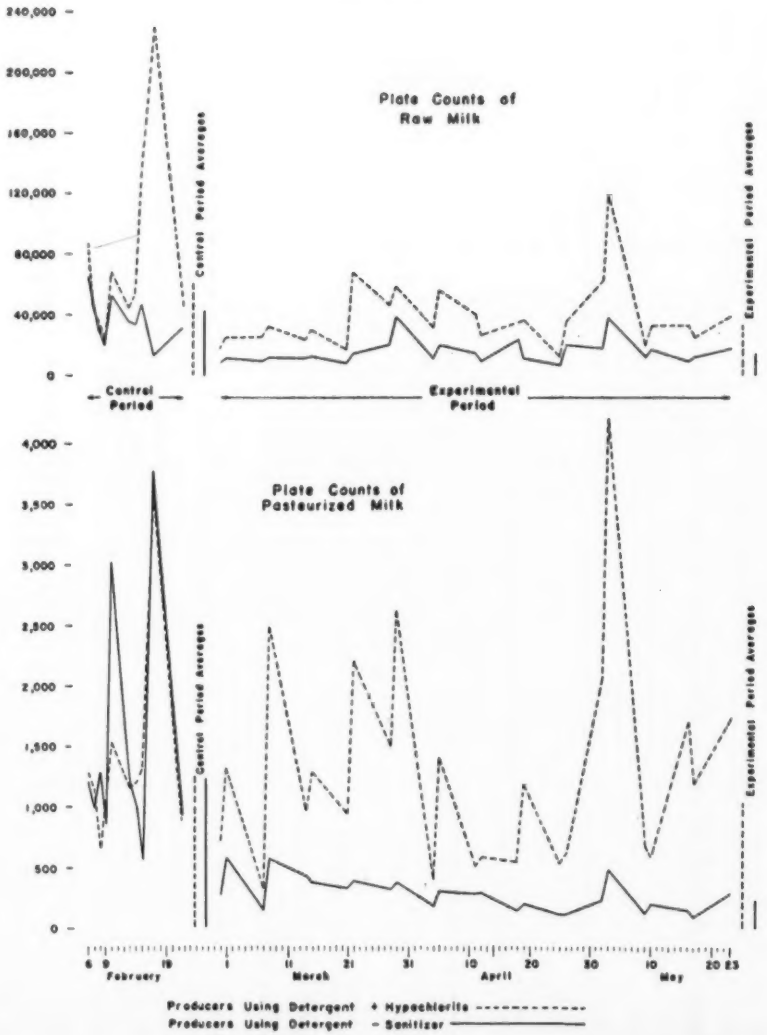


FIGURE 1

STATION A



whereby a less diligent person can more consistently maintain milking equipment in a clean and sanitary condition. Summarizing, farmers using cleaner-sanitizer #5 produced better quality milk more consistently than those using the standard cleaner and hypochlorite sanitizer.

The peaks in the total count graphs correlate approximately with the mean air temperature of the day preceding sampling. Mallmann observed that total counts were higher during warm weather.[8] Other workers have found that thermoduric counts were highest during winter months, which was attributed to lack of sufficient hot water for cleaning and to uncomfortable working conditions in the milk house.

The detersive efficiency of cleaners and germicidal activity of quaternary ammonium compounds are reduced by water hardness salts. This factor was investigated by determining the soap hardness of water used by each producer for cleaning utensils. At Station "A" this value ranged from 14 to 180 ppm (as calcium carbonate) and from 24 to 350 ppm at Station "B." In each case, the average hardness of water from farms using cleaner-sanitizer #5 exceeded that of water from farms using the cleaner and hypochlorite sanitizer. Hardness of water did not appear to affect adversely the quality of a producer's milk as measured by average pasteurized counts. In fact, producers having harder water tended to produce better quality milk.

DISCUSSION

The human factor is the weak link in the application of most sanitizing procedures to milking machines, resulting in unclean equipment and poor milk

Unsolicited comments from many producers using cleaner-sanitizer #5 during this trial, the amounts they used, and their purchase of the product after the termination of the experiment attest to its acceptability. Cleaning is paramount in any sanitization procedure as disinfection of unclean equipment is not only improper but exceedingly difficult. During this trial, patrons praised the virtues of #5 as a detergent, even claiming that it removed milkstone. There appeared to be some evidence to substantiate this. Old milk inflations often returned to their original size and shape, probably because of extraction of butter fat from the rubber. Good detergent characteristics coupled with high germicidal activity in the presence of milk solids are combined in cleaner-sanitizer #5.

Since the conclusion of the field trial, a number of dairies have made this cleaner-sanitizer available to their producers. Use has uniformly resulted in improvement of milk quality.

The success of these trials is due largely to the practical suggestions and cooperation of Messrs. Davenport, Harrison, Ricker, and Shepard of Supplee-Wills-Jones Milk Company. Laboratory facilities were graciously provided by Mr. Austin. Mrs. Copeland conducted the bacteriological analyses.

SUMMARY

Thirty-one farms using a cleaner-sanitizer composed of 10 percent Hyamine 1622, 5 percent Triton X-100, 30 percent sodium metasilicate pentahydrate, and 55 percent tetrasodium pyrophosphate produced milk with lower total and thermoduric counts than a comparable group using a standard cleaner and hypochlorite sanitizer.

REFERENCES

1. A.P.H.A. *Standard Methods for the Examination of Dairy Products.* 9th Ed. (1948).

2. Barber, F. W. Quaternary Ammonium Compounds in the Dairy Industry. *J. Milk and Food Technol.*, **13**, 266 (1950).

3. Dahlberg, A. C., Kosikowsky, F. W., Seeley, H. W., and Leventhal, A. A. The Sanitizing of Milking Machines. *Ibid.*, **13**, 5 (1950).

4. Goetchius, G. R., and Botwright, W. E. A New Method for the Evaluation of Quaternary Ammonium Detergent Sanitizer Compounds. *Ibid.*, **13**, 63 (1950).

5. Hucker, G. J. Modified Non-Ionic Synthetic Detergents and Quaternary Ammonium Compounds as Cleaner-Sanitizers in Food and Dairy Operations. *N. Y. State Assoc. of Milk Sanitarians. 21st Ann. Rept.*, 35–51 (1947).

6. Jensen, J. M., and Bortree, A. L. Storage and Treatment of Milking Machine Inflations. *J. Dairy Sci.*, **29**, 849–59 (1946).

7. Jensen, J. M., and Bortree, A. L. Storage and Treatment of Milking Machine Inflations Under Farm Conditions. *Ibid.*, **31**, 331–39 (1948).

8. Mallmann, W. L., Kivela, E., Bortree, A. L., and Churchill, E. The Influence of the Method of Sanitizing Milking Machines on the Bacterial Content of Milk. *N. Y. State Association of Milk Sanitarians. 20th Ann. Rpt.*, 177 (1946).

9. Meany, J. A. The Chicago Test of Detergent-Sanitizers for Use on Dairy Farms. *J. Milk and Food Technol.*, **13**, 279 (1950).

PURDUE WILL HOLD DAIRY CONFERENCES

Two one-day dairy conferences have been scheduled in March, 1952, at Purdue University. These conferences are as follows: Dairy Fieldmen's Conference, March 25 and Dairy Plant Operation Conference, March 26.

The conferences are a continuation of the series held annually for several years. Speakers consisting of specialists in the dairy industry and universities will discuss present day problems of fieldmen and dairy plant operators.

For further information write to: V. C. Manhart, Smith Hall, Purdue University, Lafayette, Indiana.

OREGON DAIRY MANUFACTURERS' ASSOCIATION

The 41st annual convention of the Oregon State Manufacturers' Association will be held at Oregon State College February 19-21, 1952.

The modern dairy building that has been under construction since May, 1950 will be completed by January 1st.

Speakers of national prominence will give talks and demonstrations on recent developments in several fields of the dairy industry. An attendance of 500 is expected. The annual banquet will be held during the evening of the last day.

21ST ANNUAL STATE COLLEGE OF WASHINGTON INSTITUTE OF DAIRYING

The 21st Annual Institute of Dairying will be held at the State College of Washington, Pullman, Washington, March 10-14, 1952. There will be Dairy Products Judging and Scoring Contests nationally known guest speakers will talk at this conference. For further information write Professor H. A. Bendixen, Department of Husbandry, State College of Washington, Pullman, Washington.

INSULATING GLASS—STUDIES IN ITS USE IN MILK HOUSES AND DAIRY BARNS*

W. Everett Eakin

Director of Farm Research, Libbey-Owens-Ford Glass Company, Toledo 3, Ohio

Sanitary conditions in farm buildings where milk is produced may be improved by replacing present multi-paned windows with larger units of insulating glass which better transmit the light rays of the sun. The cross bars in present windows serve as chaff and dust collectors and also hold moisture that condenses on single glass. By using larger window areas in the south wall it is possible to use the heat rays of the winter sun for additional warmth. An overhang will shade out the hot summer sun, helping to keep interiors cooler.

* Presented at Thirty-seventh Annual Meeting of the International Association of Milk and Food Sanitarians, Inc., Atlantic City, N. J., Oct. 13–16, 1950.

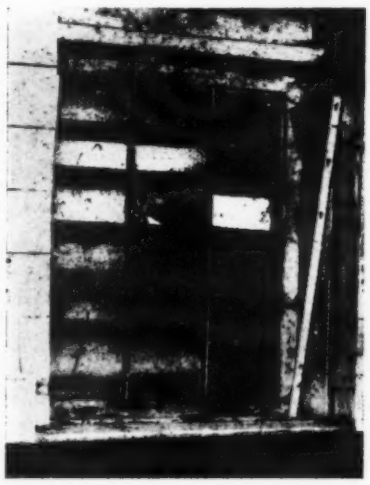
Windows in many of our milk houses and dairy barns have not been improved to any great extent over the way they existed a quarter to a half century ago. Despite rigid health requirements which include provisions for improved daylighting, windows in many of these farm structures have not been planned and used to their greatest efficiency.

In the past these windows frequently have been responsible for a multitude of problems. They have been of little help in trying to maintain moderate temperatures and keep interiors comparatively dry. They have not let in sufficient daylight, especially in the winter months when daylight hours are at a minimum.

Liability of Present Window Lighting

Windows in milk houses, dairy barns, and other farm structures have not kept pace with daylight engineering developments for homes, and commercial and industrial buildings. Today most dairy building windows are a liability. These windows have from four to nine small panes of glass to a wall opening, creating a maintenance problem and cutting down the daylighting efficiency of the window. The cross sections are dust and dirt collectors. The chaff and dirt in turn absorb moisture, creating a breeding place for germs and causing the putty to loosen. The frames soon deteriorate unless painted frequently.

In the past dairy building windows have served a dual role—letting in daylight and serving as a means of ventilation. Daylighting efficiency has been sacrificed for the sake of ventilation. Today with electric power lines reaching practically every farm, it is possible to have mechanical ventilation. In many instances fixed, insulated windows may be used, resulting in better daylighting.



In winter especially, present dairy windows fail miserably in their primary function of daylighting. There are two reasons: First, the single-pane glass frosts over, so that at a time when the daylight hours are at a minimum, very little light gets through. Second, the single panes are so cold that air currents are set up. The warm air brings over moisture and dust which collects on the surface. The windows soon get dirty. The small panes and cross sections make washing difficult, with the result that they are seldom cleaned.

Mr. W. Everett Eakin, Director of Farm Research for Libbey-Owens-Ford Glass Company, is working with a number of agricultural colleges and farm leaders in improving the daylighting of farm buildings. For the past 10 years he has been engaged in agricultural relations work. Prior to that he was farm editor of several newspapers in Ohio and Michigan for 15 years.

Dairy windows too frequently are poorly planned in relation to the sun. There has been a tendency to place the windows to the east and west with the thought of getting the morning and afternoon sun into the interior. This practice, however, lets in too much of the hot summer sun and fails to take maximum advantage of the heat rays of the winter sun when additional warmth can be used to advantage.

Advantage of Light

To the layman, the primary benefit of daylight in the building is to make the interior light enough to see to work properly. There is authoritative evidence, however, that daylight passing through glass may be germicidal, even though very little of the ultraviolet rays pass through ordinary glass.

Studies of men in the medical and sanitation field have shown that daylight passing through glass in the absence of sunlight will kill some bacteria, although at a slower rate than the direct rays of the sun. In some instances direct sunlight was about ten times as potent as diffuse daylight.

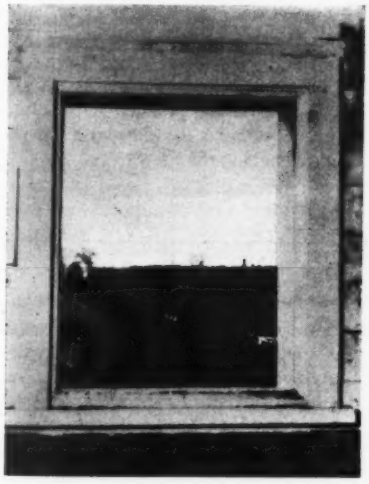
As far as the ultraviolet light is concerned, this is present to the greatest extent in the summer months at a time when livestock is outdoors much of the time. Little ultraviolet light is present in the winter sunlight, and especially during the early morning and late after-

noon periods when the sunlight passes through windows.

Preliminary studies also indicate that daylight affects the fertility of cows. In some instances cows kept in poorly lighted barns have had poor breeding records while those in well lighted buildings required less trips to the bull. The USDA's Agricultural Research Center in Beltsville, Md., used a little light trickery to reverse the normal breeding season of female sheep and goats with the result they produced their young in the fall instead of the spring. Actual changes in the heat periods were brought about by changing short winter days to long ones with artificial light, and then shortening them abruptly in the spring, when normally days are longer.

INSULATED WINDOWS

Value of insulated windows to cut



down heat loss has been recognized in the past by many agricultural leaders who recommended storm sash. Farmers, however, never would be bothered by putting up and taking down the storm sash.

Development of Thermopane insulating glass provides an answer to this problem of insulating windows. Thermopane basically is two panes of glass with a pocket of dry air sealed in by a metal-to-glass bond. Because the moisture has been taken out of the air pocket of this insulating unit, condensation does not take place between the two panes. This unit was perfected by Libbey-Owens-Ford Glass Company primarily for the home and normally is made with polished plate glass for clearer vision.

For dairy buildings and other farm structures the same serviceable unit may be made with less expensive sheet glass. It is available in nearly 100 standard sizes including several especially suited for farm buildings. Thermopane is not a new product. Units made more than 10 years ago are still giving perfect service.

Thermopane is one of a very few building products that carries an extended guarantee. This guarantee is written for a five-year period against any defects in the seal. Over a five-year period it is felt the maximum and minimum temperatures for any given locality will be experienced.

Thermopane windows provide as much insulation as a comparative amount of structural insulation. In addition they admit daylight and, in some instances solar heat. Under conditions which exist in livestock and poultry shelters, insulating windows often are considerably more efficient in letting daylight and sunshine into the buildings than ordinary single-glazed windows.

Observations of installations made for the purpose of comparing the performance of insulating windows with the conventional single-paned ones, both used under the same conditions, have shown that insulated windows gather dirt less rapidly, stay freer of condensation, and are much less apt to frost over than ordinary windows, including those protected with storm sash.

Accumulation of moisture and dirt on the glass surfaces of storm sash in the space between the panes decreases the daylight efficiency of the storm sash, especially on cold days. In the insulating type window, the sealed space filled with dehydrated air prevents this difficulty. The insulated window lets in more light per square foot of window area under actual use than ordinary windows because they stay cleaner. Also, more window area can be used without increasing the heat loss when ordinary windows are replaced. At the same time, drafts caused by cold window surfaces are minimized.

ORIENTATION TO LIGHT

Position of the windows in relation to the sun greatly affects the amount of solar energy that will pass through them. The more nearly the plane of the window approaches a perpendicular to the sun's rays, the greater will be the heat input. In the summer at our latitudes the sun rises north of east and sets to the north of west. In the summer east and west windows may be objectionable because in the early forenoon and late afternoon unwanted solar energy enters the building through them. West windows are most troublesome in this respect, because the solar heat comes through at a warmer time of the day.

Insulated windows properly oriented for sun control make it possible to keep buildings warmer in winter and cooler in summer. Likewise such windows help to maintain a higher winter temperature and by so doing help to increase the efficiency of the ventilating system in reducing the moisture problem. This is true inasmuch as the warmer air will hold more moisture, thus taking out of the building more moisture to a given volume of air moved.

The solar principle of heat which has swept the building field now may be applied to milk houses, milking parlors, and the dairy barn itself.

There are four fundamental factors of solar design: (1) Window orientation to face south to obtain the heating benefits of solar radiation in winter. (2) Larger windows which are necessary to provide proper entry of solar radiant energy in winter months. (3) Insulated glass to cut down on the heat loss. (4) Sun control which is achieved by the use of permanent or temporary roof overhangs, visors, or other means of controlling shadow areas on the windows so that sunlight can enter during cold weather and be shut out during the hot summer months.

At a recent solar energy symposium held at Massachusetts Institute of Technology, it was pointed out that from 23 to 46.5 percent of the heating requirements of a M.I.T. research house were furnished by solar energy, using triple Thermopane windows. Possibilities of storing solar energy for delayed use were pointed out. Three methods now are being used in test houses, one employing Glaubers salt, the second, using water, and the third, crushed stone.

To date the idea of storing solar heat for delayed use has not been applied to milk houses, milking parlors, and other dairy buildings, although as this procedure is developed it holds definite possibilities for farm structures. With warmer inside temperatures, and greater glass area, the sanitary conditions of these buildings should be improved.

In the past two years several milk houses, milking parlors, and dairy barns have been designed to take advantage of immediate solar heat, including those on the farm of the late H. E. Babcock of Ithaca, N. Y., and the Hugh Highsmith farm near Fort Atkinson, Wisc.

Solar heat helped noticeably in drying the interiors and warming them during the day in winter. It was found that floors could be dried quickly by properly ventilating during the middle of the day after they had been scrubbed. On most days solar heat was sufficient to make inside temperatures comfortable during evening choretime. During colder weather supplemental heat was found desirable to prevent freezing on very cloudy days and at night, and especially to warm milking parlors for the early morning milking.

A new solar-type milking parlor and milk house recently were completed on the O. P. Eichelberger farm near Frederick, Md. Dr. Robert F. Gaddis, Chief of the Division of Dairy Farm Inspection for the Bureau of Milk Control, Baltimore City Health Department, has been cooperating in observing the window performance including the improved daylighting and use of solar heat. There are fifteen windows, each 72" by 42", the window area being equal to 20 percent of the floor area in comparison with the required 10 percent.

In another study near Madison, Wisc., a critical moisture problem was corrected and daylighting improved considerably in a bank type barn where the old windows were replaced with 160 square feet of insulating glass and a mechanical ventilating system was installed. During the past winter a stable temperature of about 58° F. was maintained with a relative humidity of about 55 percent. This averaged 10 to 15 percent lower than ordinarily encountered in dairy barns.

The possibilities of daylight engineering and solar heating open a new frontier in the design and sanitation of farm buildings. The possibilities for the use of this natural resource for the benefit of man and animal are undeveloped.

ADOPTION OF THE USPHS RESTAURANT SANITATION ORDINANCE

The recommended restaurant ordinance (or one based thereon) is in effect in 675 municipalities and 346 counties located in 42 States and Alaska. It has also been adopted as State regulations in 30 States and the District of Columbia, in 20 of which it is enforced State-wide. It is in effect in areas with a total population of over 82,000,000. Included are 49 cities of over 100,000 and 43 cities between 50,000 and 100,000 population.

A summary of the type of ordinance now in force is tabulated below.

		Type of Ordinance		
	Total	Grading	Non-Grading	Not known
States	31	8	23	0
Municipalities	75	378	287	10
Counties	346	148	186	12

The full report can be secured from the Division of Sanitation, Milk and Food Branch, Washington, D. C.

H. N. CALVER ATTENDS LONDON CONFERENCE

Homer N. Calver, Secretary of the Public Health Committee of the Paper Cup & Container Institute, and Editor of the Health Officers' News Digest, has been designated Special Advisor to the Food Division of Federal Civil Defense, and has gone to London with an official Government mission which is conferring in London with representatives of the Government of Canada and the United Kingdom on the food aspects of civilian defense.

Mr. Calver has been assigned to both the emergency feeding and scientific sections of the conference.

MARKET MILK AND ICE CREAM MEETINGS TO BE HELD AT PURDUE

Two one-day dairy meetings will be held in April, 1952, at Purdue University according to an announcement by Professor H. W. Gregory, Head, Department of Dairy Husbandry. These meetings are as follows: Market Milk Plant Operator's Conference, April 23 and Ice Cream Institute, April 24.

The conferences are a continuation of the series held annually in recent years. Specialists from the dairy industry and universities will be on the programs. Ice Cream samples submitted by plants to Purdue for analysis and scoring will be examined and discussed as a part of the ice cream meeting. Foremost problems relating to the processing and distribution of bottled milk will be discussed at the market milk conference.

For further information write to: V. C. Manhart, Smith Hall, Purdue University, Lafayette, Indiana.

Association News

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INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS

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Vice-President, James A. Meany Chicago
Secretary-Treasurer, P. E. Riley, Illinois Dept. of Public Health, Chicago
Sergeant-at-Arms, Dr. L. E. Booth, ...Gardner
Executive Board Members:
G. G. Gibson .....Chicago
Dr. W. H. Haskell .....Beloit
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Florida Association of Milk Sanitarians

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Vice-President, R. R. Hood ....Pensacola
Secretary-Treasurer, Dr. H. H. Wilkkowske, Dairy Department of Florida, Gainesville
Members of Executive Committee:
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P. D. Shirley .....Tampa

Indiana Association of Milk and Food Sanitarians

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President Elect, George White .....Evansville, Indiana
First Vice-President, Russell Cunningham ..... Laporte, Indiana
Second Vice-President, John Schlegel .....Indianapolis, Indiana
Secretary-Treasurer, Joe Schneider, Department of Public Health, Indiana University Medical Center, Indianapolis, Indiana

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Vice-President, A. T. Getz .....Ames
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2nd Vice-President, Frank Kelley Parsons
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Auditors:
Junior Rogers ..... Independence
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Reporter, P. A. Mauzey .....Topeka

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Vice-President, R. M. Olander ....St. Paul
Secretary-Treasurer, Dr. J. C. Olson, Jr., Associate Professor of Dairy Bacteriology, Dairy Division, University of Minnesota, St. Paul 1, Minn.
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Vice-President, George Bauer Springfield
Secretary-Treasurer, J. L. Rowland, Director, Bureau of Food and Drugs, Jefferson City

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Vice-President, Claude Woodward..Utica
Secretary-Treasurer, C. W. Weber, 18 Dove St., Albany 6, N. Y.

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Vice-President, David Jones .....Everett
Secretary-Treasurer, L. O. Tucker, State Department of Health, Smith Tower Building, Seattle, Washington

Wisconsin Milk Sanitarians Association

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Vice-Pres. (and Pres.-Elect): Chester L. Anderson .....Oconomowoc
Sec.-Treas.: L. Wayne Brown, Wisconsin State Dept. Agric., Madison.
Directors:
J. A. Keenan .....Madison
Phillipp C. Newman ..... Beaver Dam
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Lester, I. Legrid, V. G. Rowley ..... Madison

ANNOUNCEMENT BY THE COMMITTEE ON RECOGNITION AND AWARDS

The Committee is pleased to announce that by approval of the Executive Board of the Association a **Sanitarians Award** including a Certificate and $1,000, provided jointly by the following: The Diversey Corporation, Klenzade Products Company, Oakite Products, Inc., Pennsylvania Salt Manufacturing Company and the Mathieson Chemical Corporation will be offered at the next annual meeting of the Association. The regulations covering the Sanitarian Award, are in brief:

Eligibility: To be eligible for the Sanitarans Award, a nominee shall have made meritorious contribution **in the field of milk and food sanitation** to the public health welfare of a community **or municipality**, in the United States or Canada, as the regularly employed professional dairy or food sanitarian of that community. The work on which the award is to be based must have been completed during the five year period immediately preceding January 1 of the year in which the award is being made; . . . consideration may be given to the preceding seven year period.

In judging the contribution of the nominee, special consideration shall be given to the originality of thought, mode of planing and techniques employed in carrying out the work, its comprehensive nature and its relative value to the community. Further consideration shall be given to the efforts of the nominee in establishing professional recognition in the community in which he serves, **to research and development, administrative, and educational achievements.**

Nominations: Sanitarians

A nomination for the **Award** may be sent to the Executive Secretary of the Association by any member of the International Association of Milk and Food Sanitarians, except members of the Award Committee. Nominations must be accompanied by:

1. A brief biographical sketch of the nominee

2. A resume of the work and achievement for which recognition is proposed

3. Supporting evidence of the activities of the nominee.

4. Where possible, reprints or reproduction of publication related to these efforts.

All nominations and supporting material must be in the hands of the Executive Secretary of the Association, Ritz Building, Shelbyville, Indiana, on or before April 15. **All members of the Association** are requested to give consideration to nomination of individuals whose professional work in communities has been noteworthy.

Selection of Recipient

The awards Comimttee shall act as the sole and final judge in selecting the recipient from the submitted list of nominees. The Committee may seek, where necessary, verification of or additional information in completing its assignment.

Announcement of Recipient of Sanitarians Award

Annoucement of the recipient of the Award will be made at the next annual meeting to be held in Minneapolis, September 1952.

Regulations Covering Sanitarians Award

While the above resume covers the essential points, copies of the complete regulations covering the Sanitarians Award may be procured from the Executive Secretary of the Association.

Dr. K. G. Weckel, Chairman, University of Wisconsin
H. J. Dunsmore, Pittsburgh, Pa.
L. T. Smith, Jacksonville, Florida
Leslie Jenne, Olympia, Washington
Howard Weindel, Denver, Colorado

CHICAGO DAIRY TECHNOLOGY SOCIETY

President, Paul Partz .....Chicago
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Secretary, P. H. Tracy, ...University of Illinois, Urbana
Recording Secretary, Zoe Anderson ....Chicago
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RESOLUTION ON THE PROFESSIONAL STATUS OF SANITARIANS

PRESENTED AT THE BUSINESS MEETING OF THE 28TH ANNUAL CONFERENCE OF THE NEW YORK STATE ASSOCIATION OF MILK SANITARIANS, SEPTEMBER 19, 1951

Whereas —

At the present time there is no general recognition of the professional status of Sanitarians through local requirements or educational standards;

Whereas —

Sanitarians have pioneered in the field of environmental sanitation and have gained in stature until there exists a need for recognition of the professional sanitarian;

Whereas —

Eight leading colleges, universities are now offering a 4-year curriculum leading to a Bachelor's Degree in Sanitation and Sanitary Sciences:*

Whereas —

The National Association of Sanitarians now have a system of registering Sanitarians on a sub-professional status which have been recognized by some State legislatures;

Whereas —

Both the National Association of Sanitarians and the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS have mutual interests and similar objectives and each organization has affiliated organizations in New York State.

Therefore, be it resolved that the New York State Association of Milk Sanitarians through its delegated representative of the Council of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS present this brief and following resolution either through the resolutions committee or from the floor at the 1951 Annual Meeting of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS.

RESOLUTION

Be it resolved that the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS study, evaluate, and report on the desirability of establishing qualifications and legislation for Professional Sanitarians and Registered Sanitarians either within itself or in collaboration with other national associations having similar objectives.

C. E. WEBER
adopted unanimously
4:30 p. m. 9/26/51

*The field of study covered by these curriculi more adequately prepares personnel for leadership in the field of sanitation than most other bachelors' degrees now being offered.

LOYAL C. PECKHAM HONORED BY MINNESOTA MILK SANITARIANS ASSOCIATION

Culminating their anuual meeting September 21, 1951 the Minnesota Milk Sanitarians Association honored Mr. L. C. Peckham, Dairy and Food Specialist, United States Public Health Service, by presenting him with a Certificate of Achievement in the form of an engraved scroll. The award was given to Mr. Peckham in recognition of his outstanding contribution to the dairy industry of Minnesota in the field of milk sanitation. Mr. Peckham has been transferred from the Minnesota-Wisconsin area to the Regional Public Health Service office in Chicago. During the per iod of his assignment in the Upper Midwest, Mr. Peckham played a leading part in the development of the Grade A milk programs for both Minnesota and Wisconsin. His efforts and manner of meeting the many problems in connection with his work have made him many friends. It is hoped that his many talents will be utilized to full extent in his new assignment.

Prior to the annual banquet the Association attended the conference for fieldmen which was held in connection with the University of Minnesota Dairy Products Institute. Total attendance at the conference was 172.

WORK OF THE NATIONAL RESEARCH COUNCIL FOOD PROTECTION COMMITTEE

STATEMENTS AND PUBLICATIONS

Basic Principles Involved in Evaluating Safety in the Use of Chemical Additives in Foods, June, 1951.

Basic Considerations Involved in Evaluating Hazards Encountered in the Use of Pesticides on Foods, June, 1951.

Board *Statement on the Use of Surface Active Agents in Foods,* Aug. 8, 1951.

Statement emphasizing need for additional residue data, May 15, 1951.

Committee *Statement on the Use of Surface Active Agents in Foods,* Nov. 9, 1951.

Use of Chemical Additives in Foods, Nov. 9, 1951.

Terminology and definitions covering chemicals in foods.

Paper regarding Food Protection Committee. *American Dietetic Association Journal,* March 1951.

Paper on need, value, safety and existing safeguards of chemical additives. *Food Drug Cosmetic Law Journal,* April 1951.

Leaflet, showing organization, objectives and policies of the Food Protection Committee, February and September, 1951.

IN PREPARATION

1. Bibliography of chemical methods.
2. List of chemicals used.
3. Classification system for data collected.
4. Compilation of chemical, entomological, toxicological and other data on pesticides for publication in brief form.
5. Cooperation with American Chemical Society in arranging forum discussions.
6. Technological and nutritional justification for the use of additives in foods.

PROJECTS UNDER STUDY

1. Procedures for evaluation of the safety of chemical additives.
2. Screening procedures for the chronic toxicity of new chemicals.
3. Safety of surface active agents.
4. Information prerequisite to the use of pesticides.
5. Evaluation of chemical analytical methods for the precise determination of minute quantities of chemicals in foods.
6. Brief summary 1950 Residue Hearings.

The Food Protection Committee is primarily interested in the safety of foods containing small amounts of added chemicals. There should be a clear distinction between any food hazards which may result from the presence of minute amounts of chemicals in foods, and those hazards and accidents which may accompany the manufacture or use of these chemicals. The Committee is collecting and evaluating data from industry, private, state and federal laboratories and suggesting other research data needed.

STATEMENT ON THE USE OF SURFACE ACTIVE AGENTS IN FOODS

The Food Protection Committee has reviewed the evidence placed before it by several groups interested in the use of surface active agents in the manufacture of ice cream. It is the judgment of the Committee that it is not possible to consider the use of such agents in one food, such as ice cream, without simultaneously considering the estimated consumption level of such compounds in the diet from all forseeable sources.

The agents considered may be divided into two groups; the mono- and diglycerides of fatty acids and the esters of non-glycerol alcohols. These latter include the complex esters and ester-ethers of the hexahydric alcohols and alkylene oxide and fatty acids. All of these may alter important physiologic processes due to their common property of altering interfacial tension. In addition, the non-glycerol esters present the added problem of the metabolic fate and possible toxic effects of the non-fatty acid moiety. Finally, there exists the consideration of a pharmacologic effect within the body of the absorbed intact compound.

Most preparations of these substances are mixtures characterizable only by means of various constants. Blends of the products are oftimes recommended for use in foods. These facts make it necessary that data be available on both the individual members of the group and upon blends proposed for use in foods.

With these points in mind, and on the basis of the research data made available and examined in the light of the statement, "Basic Principles Involved in Evaluating Safety in the Use of Chemical Additives in Foods" (approved for publication in June, 1951), it is our considered opinion that the data available to us on the toxicity, tolerance, metabolic fate, and nutritive value of these surface active agents proposed for use in ice cream are insufficient to permit a final judgment as to the safety of the substances for use in foods. Some of the reasons for this conclusion are:

1. The experiments have not been designed in a manner to delineate properly the toxic potentialities of the compounds. This is especially true of the non-glycerol surface active agents.
2. The knowledge of the metabolic fate, including their contribution as a source of calories and possible toxicologic effects of these compounds, is insufficient. This knowledge is most notably deficient in the portions of the molecules other than glycerol and fatty acids.
3. There is a lack of information bearing on the influence of the acute and chronic ingestion of surface active agents on pathologic changes which may acrue in a variety of species of animals.
4. The evidence available does not allow an accurate estimate of the qualitative and quantitative distribution of surface active materials of the mono- and diglyceride type naturally occuring in foods.

Without such information as this, one cannot set a satisfactory permissible level of these agents in foods. The Food Protection Committee advices, therefore, that critical studies be executed before a decision is made as to the level of these agents which might be permitted in foods such as ice cream.

This statement does not imply that the materials discussed above are harmful or hazardous. It does state the inadequacy of the present data to evaluate their safety or harmfulness.

ANNOUNCEMENT OF REGULAR CORPS EXAMINATION FOR VETERINARIANS

UNITED STATES PUBLIC HEALTH SERVICE

A competitive examination for appointment of Veterinarians to the Regular Corps of the United States Public Health Service will be held on April 1, 2, and 3, 1952. Examinations will be held at a number of points throughout the United States, located as centrally as possible in relation to the homes of candidates. Applications must be received *no later than February 26, 1952.*

Appointments are permanent in nature and provide opportunities to qualified veterinarians for a life career in research in animal physiology, pathology, infectious and tropical diseases, and in the veterinary aspects of public health, field investigation, and food sanitation. The names of applicants who successfully complete the examination will be placed on a merit roll, from which appointments will be made to fill current and future vacancies.

The examination will include an oral interview, physical examination, and written objective tests covering the professional field.

Application forms and circular of information may be obtained by writing to the Surgeon General, U. S. Public Health Service, Federal Security Agency, Washington 25, D. C., Attention: Division of Commissioned Officers.

No applications received after February 26, 1952.

FRACTIONATION OF WHEY PROTEINS AS A MEANS OF GRADING MILK POWDERS AND DETECTING ADULTERATION OF FRESH MILK WITH MILK POWDER

J. BABAD, J. AVIDOR, & A. SHENHAV *Bull. Research Council of Israel, 1,* 98 - 108 (1951).

The authors experimentally show that the quantitative determination of the nitrogen in the whey proteins precipitated on boiling the casein-free filtrate of milk consitutes a measure of the amount of "high heat" milk powders that have been added to milk in concentrations of from 10 to 15 percent upwards.

OHIO ANNUAL DAIRY TECHNOLOGY CONFERENCE

The Department of Dairy Technology, Ohio State University, are now in their new quarters, the Agriculture Laboratory Building, Ohio State University campus. The building provides office space for the faculty, plant processing in a modern plant equipped with the latest in equipment, and ample and well furnished laboratories for research. The building provides the department with one of the finest auditoriums on the campus, seating 200 people.

The industry will have an opportunity to inspect the new quarters of the department at the 19th Annual Dairy Technology Conference to be held February 5, 6, 7, and 8th. 1952. Most of the meetings will be held in the auditorium. The banquets will be held Thursday evening, February 7th, in the new Ohio Union building. The grand ballroom has been reserved for an expected crowd of 300. The Cleveland, Central Ohio, and Cincinnati dairy technology societies are holding their February meetings as part of this banquet.

The following is a tentative program of the conference.

BUTTER AND FIELD PROGRAM

Butter Program Arranged in Cooperation With The American Butter Institute.

Morning

W. I. A. In Cream and Butter: A Rapid Screening Demonstration T. V. Armstrong and W. J. Harper.

Research Program of The A. B. I. – Ray Alberts.

11:00 A Regulatory Official Examines The Butter Industry – Mrs. Susan V. Dugan.

Fundamental Problems of The Butter Industry – G. E. Shadwick.

The Butter Quality Program: A Myth or Actuality – Ray Alberts.

Clinics – Room 218 Agricultural Laboratory Building. Cream Grading.

3:30 Butter Grading.

The Economic Picture in Dairying – Mr. Mervin Smith.

A Veterinarian Looks at Dairy Cattle Disease Control – W. D. Founden.

Research In Dairy Production of Interest to Fieldmen – J. C. Shaw.

Let's Consider Sanitizers – Ronald Douglas, O. S. U.

Newer Development in Public Aspects of Our Milk Supply – R. E. Myers.

Pros and Cons of the Milking Parlor – G. Hopson.

New Trends in Farm Milk Storage and Hauling – A. Woodruff.

Let's Look At Our Plant Quality Problems – J. Steiner.

Sanitary Aspects of In-Place Cleaning of Dairy Equipment – R. F. Holland.

11:10 Building Morale Among Employees – Dale Weber.

Automatic Vending and Dairy Product Sales – R. F. Holland.

A Critical Survey of High Temperature Short Time Pasteurization – Harold Wainess.

Operation and Service Tips on Dairy Equipment – N. J. Peters

Homogenization Efficiency – Dale A. Seiberling.

Military Service Requirements for Ice Cream and Concentrated Milk Products – Dr. J. M. McIntire.

Labor Saving Through the Use of Glass Pipe – R. F. Holland.

Employee – Employer Relations – Film or slide strip: P. S. Lucas.

Symposium – Packaging and Specialties – Chairman:

1. Freezing Room Operation – Luther Mindling.
2. Fruits, Juices and Syrups – S. Blakemore.
3. Practical Plant Production Problems – Robert Wiggins.

CALENDAR

Feb. 19-21–Oregon Dairy Manufacturers' Association Annual Convention, Oregon State College Corvallis, Oregon.

Feb. 19-21–Technical Pickle School, Michigan State College, East Lansing, Michigan.

Mar. 2-7–National Association of Frozen Food Packers, Stevens Hotel, Chicago, Ill.

Mar. 4-5–Dairy Technology Conference, University of Illinois, Urbana, Ill.

Mar. 10-14–21st Annual Institute of Dairying, State College of Washington, Pullman, Washington.

Mar. 23-26–Twenty-ninth Annual Convention and Merchandise Exposition, National Sanitary Association, The Stevens, Chicago, Ill.

Mar. 23-27–121st National Meeting of American Chemical Society, Buffalo, N. Y.

Mar. 25-26–Dairy Fieldmen's Confernce and Dairy Plant Operation Conference, Purdue University, Lafayette, Indiana.

Mar. 26-27–Wisconsin Dairy Manufacturers' Conference

Mar. 30-Apr. 3–121st National Meeting of American Chemical Society, Milwaukee, Wis.

Apr. 1-2–Dairy Technology Conference, University of Illinois, Urbana, Ill.

April 1-4–National Packaging Exposition, Auditorium, Atlantic City, N. J.

May 5-9–Thirty-third Annual Convention and Exposition, National Restaurant Association, Chicago, Ill.

May 6-7–Dairy Technology Conference, University of Illinois, Urbana, Ill.

March 3-7–National Association of Frozen Food Packers, Hotel Stevens, Chicago, Ill.

May 24-28–American Association of Cereal Chemists, National Convention, Chicago, Ill.

June 8-12–Institute of Food Technologists, Twelfth Annual Meeting, Grand Rapids, Mich.

SEVENTH ANNUAL DIARY TECHNOLOGY CONFERENCE

UNIVERSITY OF MARYLAND

November 13, 14 and 15

Approximately 225 Dairy Industry men, representing 12 states and the District of Columbia attended the Seventh Annual Dairy Technology Conference at the University of Maryland on November 13, 14 and 15.

Mr. A. W. Hefti, of the Wyandotte Chemicals Corporation, explained neutral cleaners at temperatures of 120°F to 130°F gave better cleaning results than other cleaners at 140°F to 170°F. Dr. F. Fleischman of the Corning Glass Company pointed out that 7-8 percent of the payroll is used for dis-assembling and reassembling sanitary fittings. He said that glass pipelines can be cleaned in place as thoroughly as by dis-assembling and cleaning. Also, that there is an indication that coliform counts are lowered by the use of sealed glass lines.

Dr. R. N. Doetsch of the Bacteriology Department, University of Maryland, spoke on the bacteriological aspects of milk as consumed in the home. A recent research problem endeavored to find the extent and types of contamination which take place after the consumer has the milk at home. Approximately 15 percent of the 33 samples containing coliform organisms came from containers of milk unopened by the housewife. There were no samples showing the presence of proteus organisms.

Dr. C. W. England of C. Y. Stephens Dairy Industries gave a report on the Federal Ice Cream Standards hearings. He stated that the Administration has proposed a minimum of 12 percent fat and 6 percent milk solids not fat in plain ice cream with a permissable reduction of 10 percent and 5 percent due to the addition of bulky flavors. The industry has proposed a minimum of 10 percent fat and 20 percent total milk solids in plain ice cream with a reduction to 8 percent fat and 16 percent total milk solids due to the addition of bulky flavors. Dr. England has acted as technical advisor for the industries lawyers at the hearings.

Mr. N. C. Angevine of the Meyer-Blanke Company stated that in in order to obtain a highly desirable culture for cottage cheese and cultured milks, milk with 11 percent solids should be used and that it might be well to fortify the solids of fresh milk for culture purposes. Dr. J. C. Siegrist, Livestock Sanitation Service, University of Maryland said that successful mastitis control lies in management and not in the excessive use of antibiotics.

Dr. G. M. Beal, Agricultural Economics Department. University of Maryland presented charts and figures as a means of showing how the prices for dairy products have been rising, and that the future will see prices still higher.

Considerable interest was developed on eliminating garlic or onion flavors from the cow and her milk by the use of chlorophyl. Dr. G. M. Trout of Michigan State College gave an extremely interesting talk on the problems in homogenizing milk. Dr. Trout said that homogenization of market milk is dependant upon clarification for no sedimentation.

The dairy industry is operating on 70 percent efficiency, so said Dr. G. E. Holm, Head of the Division of Dairy Products Research Laboratory, U. S. Department of Agriculture, in his discussion of the "Dairy By-Products Situation". Dr. Holm said that while protein is the most expensive item in the diet, much is put down the drain. In a recent survey, Dr. Holm stated that a product containing 1 percent fat and 11½ percent solids was preferred to a 4 percent milk

Mr. Robert Rosenbaum of the David Michael Company indicated that the consumer is becoming more flavor wise and exacting in the type and degree of flavoring. Under the title of "New Methods in Production and Farm Storage of Milk," Dr. E. E. Heizer, Head of the Dairy Husbandry Department, University of Wisconsin, showed how some of the experimental cows were exposed to temperatures as low as 26° below zero and that healthy calves were born in temperatures as low as 19° below zero in the pen type barns. Mr. A. C. Woodruff of Mojonnier and Company discussed the use of producer cold wall tanks. This type of farm tank is becoming quite popular in the area.

Dr. G. H. Hopson of DeLaval Separator Company, stated that milk should be produced more economically as was shown in the case where 5 men were comfortably milking 500 cows two times per day.

PUBLIC FORUM

(This space is available to our members for informal personal expressions on *anything* that is on their minds.)

THE MEANING OF SANITIZE

NICHOLAS A. MILONE

School of Public Health
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Dr. Dahlberg's provocative and challenging editorial, THE MEANING OF SANITIZE, in the September-October 1951 issue of this *Journal* and Dr. Mallman's editorial SANITIZATION – WHAT DOES IT MEAN?, in the March-April 1950 issue, bring into prominence once more the common mis-use of the term "sterilize" as well as the use of the term "sanitize" to convey variable meanings. As is well known, the term "sterilize", as applied to the treatment of dairy equipment and restaurant utensils, is misleading, since sterility of these units under practical conditions is rarely, if ever, attained. "Sanitize" is frequently used indiscriminately to indicate proximate sterilization only, or cleaning and proximate sterilization as a combined procedure or in sequence. Without question, a term not bearing a definite, precise meaning has no place in a science, especially an applied science.

Since it behooves us to define our terms and use them strictly within their intended meaning, and assuming that at long last the Associaion itself will consider some action through a properly appointed committee, the following terms and definitions are offered for consideration:

Detergent, Detergency, Detersive, Deterge, and other technical expressions relating to the process of cleaning, have been well defined and pose no problem in usage. The use of such terms should be confined to reference to the process of cleaning onlv. In its broadest sense "detergency" applies to any process wherein foreign or undesirable material is *removed* from a desirable material whether the latter be a solid such as clothing, dishes, or dairy equipment, or even liquid or gas.

Sanitize, Sanitization are words that refer to proper cleaning and proximate sterilization, performed either separately or as a combined operation. For obvious reasons, the term "sanitizer" would either have to go out of use or its meaning be confined strictly to the utilizaion of detergent-germicide mixtures. "Sanitize" and "sanitization" would refer to thorough cleaning of utensils and equipment followed by or simultaneously with the destruction, by appropriate means, of residual microbes, not removed by the detergency process, in sufficient numbers to render these units approximately sterile. According to definition, these terms would refer to physicochemical removal of filth and microorganisms; proximate sterilization of the residual microbial population left on the unit after washing and rinsing; the destruction of all non-spore-forming pathogens possibly present, to include the destruction of large numbers of nonpathogenic microorganisms so as to render the treated surface approximately sterile, or the realization of these effects more or less simultaneously when detergent-germicide mixtures are employed. This definition is within the meaning conveved bv Dr. Dahlberg and implies that the work of the sanitarian is not limited to germicidal procedures exclusively.

Asepsis, Dorland's THE ILLUSTRATED MEDICAL DICTIONARY, 21st Edition, defines "asepsis" as the "absence of septic matter, or freedom from infection . . . an aseptic technique in which not only the instrument, the hands of the surgeon, etc., are sterile but also the entire operating room and the air completely are free of living germs." The same publication defines "asepticize" as " to render asepic; to free from pathogenic materials."

In a strict sense, asepsis is the practice of excluding infectious microorganisms but the term is usually applied to exclude all bacteria. It is common occurance in the English language for certain terms to develop special meanings of their own and there appears to be no reason why the term "asepsis", conveying a special meaning in sanitary practice, cannot be so used. It is proposed, therefore, that to indicate proximate sterilization only, without reference to cleansing, the following terms be considered:

Asepsis, Asepticize, Aseptify, Asepticity, Aseptification, Aseptici-zer, Aseptifier are proposed for use to mean treatment or treatments resulting in not only the destruction of non-spore-forming pathogens but also the destruction of large numbers of non-pathogenic microorganisms, rendering the treated surface approximately sterile. This parallels the definition of a "sanitizing" agent as proposed by Mr. Weber of the USPHS implying the selective killing of all non-spore-forming pathogens and the highest number of non-pathogenic microbes which may normally be found on utensils and equipment, in an exposure time and under conditions normally encountered or permitted. Thus an asepticizer or aseptifier would be an agent with sufficient germicidal potency to accomplish this purpose.

A strong point in favor of the proposed terminology is the fact that "asepsis" and its derivatives are familiar words, conveying the idea that aseptic practices mean safety to the individual.

KANSAS ASSOCIATION OF MILK SANITARIANS

The Kansas Affiliate of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC., held their twenty-second annual meeting at the Broadview Hotel in Wichita, Kansas, November 15, 16, 1951. It was one of the most outstanding. successful meetings ever held. Every person present found something that he could take home and profitably incorporate in his own work.

The Program:

Integration Short time High Temperature Pasteurization,, by D. T. Fitzmaurice.
Pipe Line Milkers and Their Cleaning, by Dr. Guthrie and T. B. Trimble.
Antibiotics in Calf Feeding, by E. E. Bartley.
Use of Sanitary Glass Pipping in the Dairy Industry, by H. P. Hodes.
Quaternary Ammonium Compounds for Bactericidal Treatment of Utensile, by W. R. McLean.
Producers' Relations, by R. E. Kious.
Public Health Integration, by Dr. Thomas R. Hood.

P. A. MAUZEY
Milk Sanitarian

PRACTICAL IDEAS

AWARD FOR PRACTICAL IDEAS

With prospective expansion of the Journal, the Board of Editors wishes to include, as a regular feature, a section on practical ideas, literature, and equipment for sanitarians, in which are to be presented selected anouncements of available free literature and of equipment with which sanitarians can increase the effectiveness of inspections and service. It is not, at present, intended to include announcements of sanitation aids and supplies, normally selected and purchased by established managements. Space is being devoted to this Section primarily to provide an opportunity for sanitarians to make known, and to describe, devices and procedures which they have noted (or have themselves developed) to facilitate sanitation, or to eliminate drudgery from sanitation procedure.

As an incentive to the submission of such ideas and devices, a monetary honorarium will be made for the suggestion considered best—on the basis of simplicity, low cost, and extent of applicability—in successive six-month intervals of publication.

Suggestions should be sent to C. A. Abele, 2617 Hartzell Street, Evanston, Illinois. An award committee, appointed by the President, will rate the submissions.

HELPFUL IDEAS

A SEDIMENT PUMP FOR FARM TANKS

NORVAL E. WATSON
Milk Inspector, Los Angeles City Health Laboratory, Tulare, California

The idea of making a sediment pump for testing an agitated milk supply came to me at an Inspectors' Conference Meeting which was held in Tulare, California. We were given a report that approximately half of the Los Angeles milk supply came from dairies that shipped their milk in bulk through the use of farm tanks and tanker trucks. These farm tanks were not tested for sediment because there was no equipment that could be used to get a representative sample. A general discussion was held by the group on the subject of the need for the test. It was considered impossible to get a representative sample because, if based on the regular sediment test of one pint from ten gallons, it would require a different pump for each tank due to the difference in gallonage in each individual tank. This would not be feasible either, because of the fact that all tanks are not straight-sided and flat-bottomed, the same as is a ten gallon can.

It seemed unfair to me to pump sediments on half of our milk supply which is shipped in cans, and not require the farm tanks, from which we receive the other half of our supply, to pass the same test.

Later, I discussed this matter with one of our Los Angeles City Inspectors, Mr. J. P. McCready, who also works out of the Tulare office. We came to the conclusion that we could develop a test on an agitated vat of milk, reasoning that if the milk were agitated the gallonage and shape of vat would not matter. It just happened that the farm tank dairies were under my inspection at that time so it was easy for me to conduct my experiment and try to prove our deductions to be true. I started the test by taking ten gallon samples out of vats and setting them aside for an hour or more for a sediment test in the regular manner, and then experimenting to see just how much freshly agitated milk would have to be put through a regular sediment disc to match the disc from the can which had previously been drawn from the same tank of milk. After many trials on different tanks of milk, I found that one gallon of agitated milk would yield a disc which seemed to most nearly match the disc from a settled ten gallon can of the same milk.

With this in mind, I made a pump of one gallon capacity, patterned after a regular sediment pump with a compression type rubber plunger. I used the head of my regular pump and, of course, the regular standard disc. This allows for the reading of the test in the regular manner without any change of standards.

If a sample of a very dirty milk supply is taken, or if the cream has been allowed to rise on the milk before agitation, it is very difficult to force a gallon of milk through a standard disc. For this reason, I believe the design of the pump could be improved by using a ratchet type handle in order to secure more leverage. A metered gear pump might prove to be easier to work. Possibly for taking samples from the weigh tank in plants, an air pump would be more satisfactory.

Maybe some one of you has a better idea. If you have, why don't you try it out and tell us about it? We really do need a good method of testing vats for sediments, otherwise we may find all the sub-standard dairies resorting to farm tanks.

Editor's note: We invite suggestions.

Industrial Notes

BOWMAN DAIRY RECEIVES CITATION

In recognition of a two day "Employees Convention" and Open House, Bowman Dairy Company, Chicago, was presented a certificate for outstanding Public Relations by the American Public Relations Association at its annual convention in Philadelphia, November 14 and 15. Organizations in all parts of the United States and in practically every field of social and commercial activity vied for the 1951 Awards, the most coveted prizes in the Public Relations profession.

Bowmans "Employees Convention" was held in conjunction with the grand opening of the company's new ice cream plant in Chicago. Unique in its appeal, the Convention's interest was centered around 19 booths representing the departments of the Bowman Organization. Each booth depicted the functions of the department it represented and each was planned, executed, and manned by members of the departments. In a matter of minutes every Bowman employee was able to acquire a complete, colorfully illustrated, and interesting picture of all Company operations. The Public Relations Department under the direction of J. W. Sheehan believes good public relations begin within the hearts and minds of the employees themselves.

Bowman's citation by the A. P. R. A. said, "This Public Relations program is a striking instance of the long-lasting benefits of a well-conceived and prepared one-shot operation . . . .

"These displays were so successful and their part in the ceremony so well received that they continue a topic of friendly conversation and have in fact been made part of the school for new employees, instilling the spirit of friendly labor-management relations in each newcomer."

HANDBOOKS ON TRANSPORTATION SANITATION

Two new publication of interest to railroads and related industries have been issued by the Public Health Service, Federal Security Agency.

The new publications are entitled "Handbook on Sanitation of Dining Cars in Operation" and "Handbook on Sanitation of Railroad Passenger Car Construction." They are the third and fourth of a series of pamphlets dealing with various interstate carrier sanitation requirements of the Interstate Quarantine Regulations. The two preceding booklets delt with vessels in operation and railroad servicing areas. Another, on air carrier sanitation, is in preparation.

Both booklets were produced by the Interstate Carrier Branch, Division of Sanitation, of the Public Health Service, in cooperation with the Joint Committee on Railway Sanitation of the Association of American Dining Car Officers. Both are obtainable from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., the handbook on "Dining Cars in Operations," (PHS Publication No. 83) selling for 20 cents, and the one on "Railroad Passenger Car Construction" for 15 cents, (PHS Publication No. 95).

INFORMATION AVAILABLE ON "CONTROL OF MICROORGANISM POPULATIONS"

Four articles on the "Control of Microorganism Populations", recently written by Alfred L. Sotier of Wyandotte Chemicals Research Department, are now available in one cover. Requests for Form 1292, Wyandotte Chemicals Corporation, Promotion Department, J. B. Ford Division, Wyandotte, Michigan, will be given prompt attention.

The articles by Mr. Sotier discuss —

1. Natural and man-made agencies which control organisms.
2. Chlorine germicides
3. Quaternary ammonium germicides
4. Detergent-sanitizers

BULK SYSTEM OF HANDLING MILK FROM FARM TO DAIRY

A. C. WOODRUFF

Mojonnier Bros. Co., Chicago, Illinois

Excerpts from paper presented at Dairy Technology Conference University of Maryland, College Park, Md.

Nov. 14, 1951

The increased labor costs on the farms and dairy plants, as well as labor availability, are serious problems facing us today. The increasing emphasis on product quality improvement makes it necessary for every dairy farmer and plant operator to consider new methods which will result in better dairy products.

DEVELOPMENT OF BULK SYSTEM

The bulk system of handling milk, from farm to plant, received its start in California back in 1938. The California method was to pour the milk from the milk bucket into a dump tank, then pump over a surface cooler and store in an insulated storage tank. This system was practical where large herds were involved, but was not adaptable to the average-sized dairy.

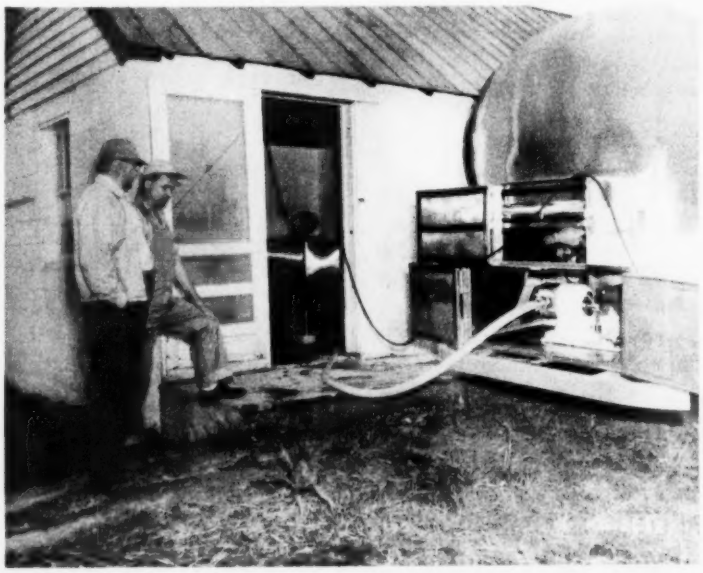
In 1944 our company proposed a method of handling milk in bulk by straining the milk directly into a refrigerated cold wall tank. This greatly simplified the California plan and has proven very satisfactory and acceptable to the average size milk producer.

The first installation of the bulk system in the Eastern section of the country was in Connecticut and in South Carolina in 1948-1949. The Connecticut installation used plain tanks with an aerator suspended in the tank whereas the South Carolina installation used all stainless steel cold wall tanks.

Since the Columbia installation in 1949, several additional bulk routes have been started in other areas. The Green Valley Farms route at Haddonfield, N. J. is perhaps one of the most unique in the country. There we pick up milk from small, medium, and large producers. By large producers, we mean a producer shipping about 25 cans. Tank sizes on the Green Valley Farm's route vary from 60 to 300 gallons. At Keota, Iowa, a route was started recently on 'every other day' pickup basis. Most producers on this route had originally shipped to butter plants and they converted to fluid operation on an 'every other day' pickup basis right from the start. Two routes have recently been started on the Frederick, Maryland area, the milk going to Lucerne Milk Company, Washington, D. C. Additional routes are planned, starting about January 1, in the same area as well as several routes in Northern Virginia.

In addition to the bulk routes already in operation, there are a great number of individual tanks installed on farms all over the United States where bulk routes are not in operation. On these farms the tanks are installed on high legs for can drawoff or a pump is used to pump the milk into cans for regular can truck pickup. Due to the widespread publicity given to the bulk system and its enthusiastic acceptance by progressive dairymen, many producers who are finding it necessary to make changes in their milk cooling system, either due to obsolence or expansion are carefully considering the use of the producers cold wall tank. When bulk routes are established later, they will be in a position to have their milk picked up in bulk and will not have to consider disposing of good can-cooling equipment.

There are a number of factors to consider in setting up a bulk route. A most important consideration is the size of the tank. It is easy to understand that the tank must be large enough to take care of peak production; also future increased production should be given careful thought. Since the stainless steel cold wall tanks will last from 20 to 30 years, the size selected should be large enough to meet any future needs. Other factors to consider are the possibility of every-other-day pickup and unusual road conditions where it might be desirable to have the tank hold at least 3 milkings.



1800 gallon stainless truck making pickup from 200 gallon tank on farm of Phillip Watkins, Cedar Grove, Maryland

Driver "weighing milk" in 400 gallon tank on Walter J. Hahn Farm, Frederick, Maryland.

When the tank is installed, it is leveled and then calibrated by filling with water in 5 gallon increments. A stainless steel measuring stick is supplied with the tank. A calibration chart is then made and then the reading in inches and fractions on this stick represents pounds of milk in the tank. With the tank is supplied a Freon combination air and water-cooled compressor. This may be installed either in the milk house or outside under suitable protection. Construction is similar to the larger cold wall tanks which are used in milk and ice cream plants.

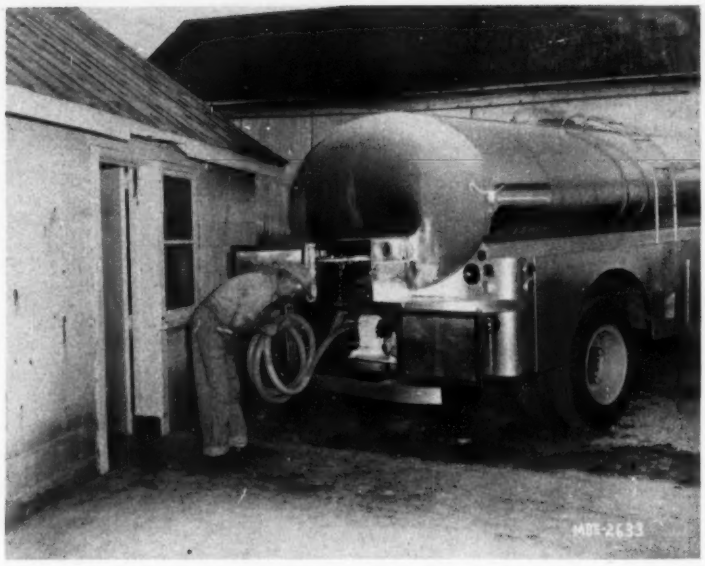
OPERATION

The milk is poured direct from the milking pail or transfer vessel into a strainer which fits the lid of the tank. Cooling is very rapid. With normal milking rates, milk is cooled to approximately 38°F. within about 15 minutes after completion of the milking operation. The temperature is thermostatically controlled and the compressor and agitator are shut off when the milk reaches the desired temperature. The milk is then held over night with only a degree or two rise in temperature. The morning milk is then strained directly into the night milk. The blend temperature does not usually rise about 45°F. and again the milk is cooled to about 38° within about 15 minutes of the completion of the milking.

The milk then remains in the tank until the driver arrives for the pickup. Various types and sizes of tank trucks are used. The selection depends upon local conditions such as road conditions, distance of farms from plant, accessibility of dairy houses and the preference of the hauler. At Green Valley Farms in New Jersey a 3000 gallon 2 compartment trailer tank is used. Guernsey milk is placed in one compartment and mixed herd milk in the other. At Edisto Farms Dairy, Columbia, S. C. a 2000 gallon trailer tank is used. At Swaner Farms Dairy in Iowa City, Iowa we are using a 2000 gallon straight truck tank with tandem rear axle. This works very well under the difficult road conditions in Iowa.

Recently they had a 6" rainfall there and the truck made all the pickups under these extreme conditions the same day. In the Connecticut area, they are using in one place a 3500 gallon tanker trailer which makes a 178 mile round trip. Another Connecticut firm, Tranquility Farms at Waterbury, is using a 750 gallon tank mounted on a straight frame truck. In the Maryland area we are using 1800 gallon straight truck tanks at present. This size of truck weighs about the same as the present can trucks and is able to reach the dairy houses under some difficult barnyard and lane conditions. When additional tanks are installed, it is planned to make two loads per day with these tank trucks. Since the routes will operate within a 35 mile radius of Washington, D. C. and present experience shows that it takes less time to pick up milk this way than with cans, this is exremely practical. About January 1, a 1500 gallon tank truck will be operating within a 20 mile radius of Frederick, Maryland. It is planned to pick up 3 loads a day with this tank. A smaller tank is being used as there are some extremely bad lanes and roads to cover.

Arnold tanker in pump-out position on Tallmadge Watkins Farm.



Driver rolling up Tygon tubing after picking up milk on Charles Lee Watkins Farm, Cedar Grove, Maryland.

The tanker trucks are supplied with compartments that hold the pumpout pump and sample trays. To transfer the milk from farm to tanker, a Tygon plastic hose is used. The first step upon arriving at the farm is for the driver to check the milk for quality by checking the odor or, in some cases, actually tasting the milk. The next step is to insert the calibration stick to determine the amount of milk in the tank. After referring to the calibration chart, a weigh slip in duplicate is made out, one being left with the producer. The temperature of the milk is also entered. The agitator is then started and, in the meantime, the pumpout hose connection is made. When this is completed the milk is ready for sampling. Milk is then transferred to the tanker by the pump on the truck. A cap is placed on the end of the hose, the tank rinsed out, and the driver is on his way. Total time at farm varies from 6 to 15 minutes, depending on size of tank, sampling and other matters which may come up for discussion when the driver is at the farm. This system of milk handling obviously offers many advantages to the producer, hauler and processor.

Cap used to seal off end of Tygon tubing. During pump-out operation, cap is placed on floor in inverted position so that sanitary threads do not touch floor.

RELATIVE ADVANTAGES

The chief advantages to the *producer* are the following:

1. Increase in milk yield by elimination of the inevitable can stickage losses. This amount varies from a half pound to a pound and a half per can depending on the can dumping procedure. Fat stickage to the shoulders and lids of milk cans result in a greater percentage of fat loss than actual milk solids.

2. Elimination of milk losses due to accidental spillages between farm and dairy as well as can runover at the milking time.

3. Elimination of much of the hard work at milking time. Bulk system actually saves man hours of labor connected with the milking operation.

4. Elimination of milk cans. Saving in replacement costs.

5. The bulk method frequently results in a reduction of the hauling rate. The amount of the reduction depends on local conditions. In the Maryland area rates have been reduced from 24 to 20 cents per hundred weight. At Edisto Farms, Columbia, S. C., the rate was reduced from 35c to 20c per hundred weight.

6. There is usually a saving in the electric bill with the producers cold wall tank system of cooling milk. Users report savings from a $1.00 up to $8.00 per month, depending upon the amount of milk shipped.

7. The producer sells his milk in his own milk house, thus eliminating controversy over milk weights.

8. Butter fat sampling is made under ideal conditions.

9. Better quality milk is produced as a result of the faster cooling and colder storage on the farm. Producers report aeration during cooling helps remove odors.

10. When building a new milk house, a smaller building is required. It is possible to increase production using present dairy house as the producer tank takes up much less room and there is no need for can rack space.

The advantages to the *hauler* are:

1. Does away with all of the hard work of handling milk cans. As Nip Milloy, milk driver at the Green Valley Farms says - "The hardest job is driving the truck."

2. Makes it possible to use older men on the routes and also men with lesser physical qualification than required for can truck operation. It is easier to maintain personnel on the tank routes than on the can routes.

3. Bigger pay loads are possible with the tank trucks.

The advantages to the *dairy* are as follows:

1. Better quality milk will be received due to the faster cooling and storage in the producers cold wall tank.

2. Colder milk will be received at the dairy, thus making a saving in refrigeration.

3. The bulk system eliminates can washing, receiving, and sampling operations.

4. On some dairies it would be possible to eliminate all receiving room equipment. This is the case at Green Valley Farms Dairy where the milk is pumped direct from the tank truck into the pasteurizing vat.

5. Elimination of the can washer helps solve the sewage problem from the can rinsings.

6. It would be entirely possible with the bulk system to eliminate receiving plants in the country. Milk could be picked up on the farms and brought in direct, thus eliminating the investment in equipment and expense of operating receiving stations.

Is it any wonder the

Year	Millions of quarts of milk sold in villages and cities	Millions of Paper Containers produced... *all makes*	Percent Paper is of total	% PURE-PAK is of all milk sales
1940	15,590	750	4.8%	.9%
1941	16,215	1,110	5.8	1.7
1942	17,512	1,750	10.0	2.9
1943	19,070	2,200	11.5	3.3
1944	20,000	2,271	11.4	3.3
1945	21,395	2,281	10.7	3.3
1946	21,860	2,957	13.5	4.8
1947	20,930	3,932	18.8	7.5
1948	20,698	5,014	24.2	9.7
1949	20,930	6,456	30.8	13.0
1950	21,000	6,550	31.2	16.9
1951	(*last six mos. estimated*)			20.0